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# **THE REVIEW OF APPLIED ENTOMOLOGY.**

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MCMARTIN (A.). **The Locust Fungus. Further Observations.**—*S. Afr. Sugar J.* **18** no. 6 pp. 329–331. Durban, 30th June 1934.

*Empusa* appears to have recently become fairly well distributed on locusts throughout the sugar-cane belt in Natal. Living locusts probably become infected in the evening or in damp weather by coming into direct contact with the dead ones. Death occurs when the insect is inactive at night or during the day in dull, damp weather, and the fungus appears between the abdominal segments fairly quickly under damp conditions. The conidia, which are only produced in large numbers in a dry atmosphere, appear as a glistening yellow powder covering the insect and the leaf to which it is clinging. They germinate if damp conditions continue for at least a few hours, but further development ceases in the absence of living locusts. A brief outline is given of the life-cycle in the field. The fungus has not yet been successfully cultured on an artificial medium [*cf. R.A.E., A 13 527*] or transmitted artificially in cage experiments. It is difficult, if not impossible, to assess the value of attempting to spread it by releasing insects that have been rubbed with dead, diseased ones or dipped into a mixture made of their crushed bodies. The redwing locust appeared in Natal in 1894 and was found to be infected with *Empusa* in 1895, but the fungus had failed to control it by 1900. This suggests that, though it checks the increase of locusts, it does not effect complete control.

DYMOND (G. C.). **Locust Effects on Sugar Manufacture.**—*S. Afr. Sugar J.* **18** no. 6 pp. 341–345. Durban, 30th June 1934.

Investigations in two factories in Portuguese East Africa showed that defoliation of sugar-cane by locusts only affects the manufacture of the product in so far as it causes a reduction of sucrose and purity, which may, however, be considerable. Conditions differ in several respects from those prevailing in Natal; notably, the plantations are separated by uncultivated areas, so that it is much more feasible to prevent locust swarms from settling, and the cane is cut yearly, instead of being allowed to grow for two years. The effect of different degrees of defoliation of the sugar-cane at different stages of its growth is discussed with reference to observations by S. Cooke.

NAVÁS (L.). **Décadas de insectos nuevos. Década 25.**—*Brotéria* **30** no. 1 pp. 15–24, 7 figs. Lisbon, 1934.

VAYSSIÈRE (P.). **Sur un *Embia* nuisible en Afrique occidentale française.**—*Bull. Soc. ent. Fr.* **39** no. 12 pp. 188–191, 10 figs., 3 refs. Paris, 1934.

The new insects described (in Latin) in the first paper include *Embia vayssierei*, sp. n., from Senegal, notes on which, including a more detailed description, are given in the second. As many gravid females were found among more than 100 examples examined in all stages of development, in spite of the absence of males, it is suggested that this Embiid may reproduce parthenogenetically, although this phenomenon is not known to occur among the Embioptera. Species of the genus *Embia* generally live on the ground, mainly under stones, occurring gregariously under the conditions of darkness and humidity that favour their development. *E. vayssierei*, however, was found in large numbers in stored ground-nuts and cereals, making its tubular webs in the upper

layers. The series of galleries formed sometimes extends to a depth of about 18 inches. The presence of the webs among the ground-nuts produces fermentation and increases acidity.

SUBRAMANIAM (T. V.). **Administration Report of the Entomologist for the Year 1932-33.**—*Rep. Mysore agric. Dep. 1932-33* pp. 57-62. Bangalore, 1934.

A severe local outbreak of *Diacrisia obliqua*, Wlk., occurred in Mysore in January, injury being caused to vegetables, fruit trees, etc. In tests of washes against larvae of *Xylotrechus quadripes*, Chevr., in their tunnels in coffee, the percentage mortalities obtained were 30 with a 10 per cent. coal tar distillate boiling at 280-360°C., 25 with one boiling at 180-230°C., and 30 and 60 respectively with sodium arsenite in an emulsion of kerosene or wood tar distillate, but the two sprays containing sodium arsenite caused discoloration of the green tissues of the bark [cf. *R.A.E.*, A 22 15]. Outbreaks of *Epilachna* [*vigintioctopunctata*, F.] occurred on potato early in the year and on the summer crop, the latter being very severe and unusual. Hongay [*Pongamia glabra*] oil resin soap [cf. 21 500] was as effective against *Idiocerus* spp. on mango and Aphids on cabbage as fish-oil resin soap. A study of the numbers of *Schoenobius bipunctifer*, Wlk. (*incertellus*, Wlk.) attracted to light-traps throughout the rainy-season and summer crops showed that two main generations occur during the growth of the summer rice, in February-March, soon after transplanting, and in May-June, when the developing ear-heads are destroyed. The greatest numbers of moths were obtained during August-September, soon after transplantation of the rainy-season crop, and during May-June, before the harvest of the summer one. Infestation is not apparent in the early stages of the growth of the rice, owing to profuse tillering. *Sesamia* sp. bores into rice stems in small numbers. All stages of *Oryctes rhinoceros*, L., were found in large numbers on fermenting megass near a jaggery house in the vicinity of a coconut plantation. Trap pits containing cow dung attracted more beetles than those containing leaf mould, decaying vegetable matter, etc.

*Argyria sticticraspis*, Hmps., which is generally the most injurious borer of sugar-cane, and *Scirpophaga* [*nivella*, F.], which is more abundant in some areas, are both parasitised by *Trichogramma* and *Phanurus beneficiens*, Zhnt., the eggs of *Scirpophaga* being preferred. The use of powder from the root bark of *Mundulea suberosa* against Bruchids in grain [22 351] has advantages over sand in that no insects escape and there is no sand to get mixed with the grains. A filtered water extract of the powdered stem bark of *M. suberosa*, used at 5 per cent. strength, gave 95 per cent. control of green scale [*Coccus viridis*, Green] on coffee in about 6 days.

SUBRAMANIAM (T. V.). **The Lantana Seedfly in India, *Agromyza* (*Ophiomyia*) *lantanae* Froggatt.**—*Indian J. agric. Sci.* 4 pt. 3 pp. 468-470, 1 pl. Delhi, June 1934.

*Ophiomyia* (*Agromyza*) *lantanae*, Frogg., which had previously been thought not to occur in India [cf. *R.A.E.*, A 8 473], was found in 1933 in the fruits of *Lantana camara* in Bangalore. A few adults of this Agromyzid that emerged from material imported from Hawaii had been liberated there in 1921 under extremely unfavourable climatic conditions, but no evidence of breeding in the berries had subsequently

been observed [*cf.* 12 550]. Further samples from widely separated localities in Mysore State had 2–5 per cent. infested berries, and from others obtained from Travancore, Saharanpur, Bombay and Burma large numbers of the flies emerged. A number of fruits in Ceylon showed traces of infestation by the larvae, but no examples were collected. Investigations are being undertaken on the effect of the fly on the germination of the seeds; in several berries, larvae have fed for some time in the fleshy tissue and completed their development in the fruit receptacle, without entering the seeds. It is considered more likely that *O. lantanae* has been present in India for a long time (perhaps since the introduction of the plant) and has been overlooked, than that the progeny of the small number of flies liberated should have spread so extensively.

STICKNEY (F. S.). **The External Anatomy of the Red Date Scale, *Phoenicococcus marlatti* Cockerell, and its Allies.**—*Tech. Bull. U.S. Dep. Agric.* no. 404, 162 pp., 78 figs., 16 refs. Washington, D.C., May 1934.

The tribe PHOENICOCOCCINI (tentatively placed in the subfamily DIASPINAE) is erected to include *Phoenicococcus marlatti*, Ckll., a pest of date palms in California, and 11 related species belonging to 4 other genera of which 3 are new and contain 7 new species. These Coccids are recorded from palms in widely separated localities throughout the tropics and sub-tropics, and it is possible that others of them, like *P. marlatti*, may become established on date or ornamental palms in the United States. Notes are given on the comparative morphology of the tribe, together with descriptions of all stages of both sexes of the individual species and records of their distribution and food-plants, where known. Keys based on the characters of the various stages are included.

TOWNSEND (C. H. T.). **New Neotropical Oestromuscoid Flies.**—*Rev. Ent.* 4 no. 3 pp. 390–406. Rio de Janeiro, September 1934.

Among the new genera erected is *Jaynesleskia* for *Leskiomima jaynesi*, Aldr. [a Tachinid parasite of *Diatraea saccharalis*, F., in Argentina (*R.A.E.*, A 20 568; 21 505)].

BRITTON (W. E.). **Connecticut State Entomologist, Thirty-Third Report 1933.**—*Bull. Conn. agric. Exp. Sta.* no. 360 pp. 385–486 & xxvii–xxxii, 15 figs., 1 graph. New Haven, Conn., March 1934. [Recd. August 1934.]

An annotated list (pp. 389–404) is given by W. E. Britton of a number of insect pests occurring in Connecticut during 1933. Britton and J. T. Ashworth record work done in the control of the gipsy moth [*Porthetria dispar*, L.] (pp. 426–433); though a larger area was examined, fewer infestations were found than in 1932 [*cf.* *R.A.E.*, A 21 510]. Britton, M. P. Zappe and J. P. Johnson report (pp. 433–440) on measures for the disposal of stubble and weeds enforced against the European corn borer [*Pyrausta nubilalis*, Hb.] in 1933 and on surveys of its incidence on early and late sweet maize. The first-brood larvae entered the ears and injured the junction of the ears and stalks. The second brood damaged late sweet maize and *Dahlia*. Estimates from growers of losses of seed maize ranged from

5 to 25 per cent. The larvae infested the stalks of an early variety of potato in one county.

In laboratory tests described by N. Turner (pp. 445-446), a dust of 1 lb. barium fluosilicate and 5 lb. lime applied to wet foliage gave 89 per cent. control of *Epitrix cucumeris*, Harr., on potato. In the field, however, as judged by the crop yield, barium fluosilicate was sometimes inferior to lead arsenate [cf. 21 511] and always to Bordeaux mixture [cf. 22 280], which also controlled the potato leafhopper [*Empoasca fabae*, Harr.].

In apple spraying experiments by Zappe and E. M. Stoddard (pp. 447-448), 4-6 applications of 3 lb. lead arsenate, 10 lb. hydrated lime and 1 U.S. qt. fish oil in 100 U.S. gals. [cf. 22 534] gave the best control of curculio [*Conotrachelus nenuphar*, Hbst.], which was the chief pest. There was considerable foliage injury in all plots in which calcium arsenate was substituted for lead arsenate. With either arsenical, the residue of arsenic trioxide or lead per lb. of fruit was always under the legal tolerance (0.01 and 0.02 grain, respectively). The results of sprays used against *Typhlocyba pomaria*, McAtee, on apple [22 399] are given by P. Garman and J. F. Townsend (pp. 449-451). Garman (pp. 451-458) reports on experiments with substitutes for lead arsenate in sprays against pests of apple and peach. Six applications of lead or calcium arsenate (3-4 and 2 lb., respectively, in 100 U.S. gals.) often scorched the leaves. The residue from calcium arsenate was removed by about 10 ins. of rain in two months. Calcium arsenate sprays containing stabilisers scorched the foliage as much as others, but the presence of these sometimes retarded the injury. Calcium arsenate caused most russetting of apples when mixed with lime-sulphur, and least with sulphur-lime dry-mix. The arsenic and lead residues from lead arsenate sprays on one variety of apple after 75 days (but not always after 51 days) and on all winter varieties were below the tolerance. The addition of fish oil to lead arsenate without lime (but not with lime) sometimes increased the lead residue. Synthetic cryolite (4 lb.) gave promising results against *Conotrachelus* and codling moth [*Cydia pomonella*, L.] and when combined with lime and flotation sulphur did not cause scorching; the residue at harvest was below the tolerance of 0.01 grain fluorine per lb. when the last spray was applied on 28th July. Peach trees were not injured by applications on 26th May and 7th June of 4 lb. barium fluosilicate with 4 lb. wettable sulphur in 100 U.S. gals. The addition of 4 lb. zinc sulphate prevented scorching by sprays of 3 lb. acid lead arsenate. Examination of fallen fruit in June and July showed that both these treatments controlled *Conotrachelus* better than 4 lb. basic lead arsenate. Zinc and magnesium arsenates severely injured the leaves of both apple and peach.

In tests of ten proprietary insecticides by Garman (pp. 458-461) against *Aphis rumicis*, L., on nasturtium leaves in greenhouses, none was as effective as nicotine sulphate or anabasine sulphate. At a dilution of 1:3,200 with the addition of soap, anabasine sulphate was superior to nicotine sulphate. Apparently neither insecticide deteriorated with keeping. Pure anabasine gave better control than pure nicotine alkaloid, both in water alone and with pure soap. When 1 U.S. qt. of either sulphate was used with 4 lb. soap flakes in 200 U.S. gals. water against *Anuraphis roseus*, Baker, on apple, anabasine sulphate was slightly more toxic to Aphids that were actually covered with spray. In other trials, both materials gave good control at

1 : 800 with soap, and favourable results were obtained by combining anabasine sulphate with lime-sulphur. Anabasine sulphate (1 : 1,000) with 1 part of a bead soap almost completely exterminated *Myzus persicae*, Sulz., on peach seedlings. Tests on eggs of *Cydia* (*Grapholitha*) *molesta*, Busck, show that anabasine sulphate has no value as an ovicide, and it is apparently not a stomach poison.

Garman (pp. 462-463) and J. C. Schread (pp. 463-466) report on the parasites of *C. molesta* [cf. 22 314, 316] on peach. The developmental period of *Trichogramma euproctidis*, Gir., a parasite of European origin, varied from  $7\frac{3}{4}$  to 12 or 13 days at 80°F. and 60 per cent. relative humidity. Adult emergence from host eggs refrigerated at 38°F. was markedly retarded, and the development of the subsequent generation was also slower than normal; the proportion of females was decreased, and it was not till after several generations that the normal ratio of 2 males to 3 females was restored. Wing deformity [cf. 22 315] was also more noticeable after refrigeration. The number of eggs of *Sitotroga cerealella*, Ol., parasitised by one female ranged from 5 to 18. *Thyridopteryx ephemeraeformis*, Haw., was a better host for this species, owing to its larger size, but on an average only 15-25 per cent. parasitism could be obtained. Attempts to fertilise females of *T. euproctidis* by males of *T. minutum*, Riley, or *T. pretiosum*, Riley, were unsuccessful. As a parasite of *C. molesta*, *T. euproctidis* is much inferior to the native species. Although over 100,000 adults were liberated in peach orchards in 1933, none was recovered.

Britton (pp. 466-472) records injury to garden plants by *Aserica* (*Autoserica*) *castanea*, Arrow, for which control measures are recommended [cf. 21 456; etc.], and to pear by *Nodonota puncticollis*, Say (rose leaf-beetle), which mutilated about half the fruit on one tree, besides eating a few rose leaves. A lead arsenate spray is suggested for control. The adults of another Eumolpid, *Chrysochus auratus*, F., caused considerable injury to rose leaves. A short account of its bionomics in the United States is given from the literature. The eggs, which are deposited, 3-4 together, in small black conical capsules, have been observed on the leaves of dogbane (*Apocynum*). The larvae drop to the ground on hatching and feed on the roots. They hibernate and pupate in May. The adults, which are polyphagous, are present from June to August. There is one generation each year.

B. H. Walden (p. 473) reports that injury by the gladiolus thrips [*Taeniothrips gladioli*, Moul. & Stnw.] was less severe than in 1932. Control measures are suggested [cf. 21 479, etc.].

Miscellaneous insects on which notes are given by Britton or others (pp. 474-483) include: *Hypera* (*Phytonomus*) *rumicis*, L., on sorrel grown for seed; *Lachnosterna* (*Phyllophaga*) *tristis*, F., on raspberries and garden beans; *Anomala* (*Pachystethus*) *lucicola*, F., which defoliated 1,200 grape vines in 2 or 3 days, and against which a lead arsenate spray was recommended; *Dibrachys cavus*, Wlk. (*boucheanus*, Ratz.), occurring as a primary parasite of *Sitotroga cerealella* used for rearing *Trichogramma*; *Pseudocneorrhinus setosus*, Roel., on garden plants (on which lead arsenate appeared to act as a repellent) and young hemlock [*Tsuga*]; adults of *Otiorrhynchus* (*Brachyrrhinus*) *ovatus*, L., infesting houses, where, however, they were apparently harmless; larvae of *O. ovatus* and *O. (B.) sulcatus*, F., on roots of yew [*Taxus*]; *Scolytus multistriatus*, Marsh., on elm in five new localities; *Gryllus assimilis*, F., destroying about 20 per cent. of a crop of tomatoes, having migrated from adjacent grassland; cutworms, including

*Lycophotia margaritosa saucia*, Hb., on pepper [*Capsicum*]; and *Tineola biselliella*, Hum., which has caused considerable injury to the felts of pianos. In one instance, the infested felts were cleaned and painted with a solution of rotenone in carbon tetrachloride in 1932, and this treatment has prevented re-infestation for over 1½ years.

Plots of onions sprayed on 9th and 20th June with nicotine sulphate (1 : 800), pyrethrum soap (1 : 600) or rotenone (1 : 400), all used with 0.5 per cent. dry soap, against *Thrips tabaci*, Lind., did not give any better yield than untreated ones. Applications of nicotine sulphate on 2nd, 9th, 19th and 28th June reduced infestation but did not give lasting protection. More injury and oviposition by *Epilachna corrupta*, Muls., occurred on bean plants spaced 2 inches apart than on those at 4, 6 or 8 inches. Those planted between 11th May and 1st June gave a marketable crop without spraying, those between 10th and 20th June or after 21st July required one spray, and those between 30th June and 10th July two sprays. No spray was necessary after the pods were formed. Among satisfactory insecticides [21 346], a spray of 3 lb. magnesium arsenate and 2 lb. casein-lime in 100 U.S. gals. water is recommended. Pyrethrum and rotenone dusts following applications of arsenicals gave a higher percentage of uninjured pods; these dusts were also effective when used throughout the season.

In addition to *Rhyacionia buoliana*, Schiff. [21 566], pine tips have also been attacked during the last two years by *R. rigidana*, Fern., *R. comstockiana*, Fern., *R. frustrana*, Comst., *Eucosma gloriola*, Heinr., and the Tineid, *Battaristis vittella*, Busck. The larvae of *R. rigidana*, which is common on red pine [*Pinus resinosa*], drill into the buds and continue downwards for 2-3 ins. into the twigs. There are two generations a year, the pupae overwintering. It is often confused with *R. frustrana*, the bionomics of which [cf. 21 353; etc.] are similar. The larvae of *R. comstockiana*, which was common on Austrian, Scots and pitch pines [*P. nigra* var. *austriaca*, *P. sylvestris* and *P. rigida*], tunnel from 1 to 6 ins. inside the twigs, their presence being indicated by a mass of pitch often 1 inch in diameter, and hibernate on them. *E. gloriola* [cf. 20 225], which causes the terminal 6-8 ins. of twigs of white pine [*P. strobus*] to die back, pupates in the soil. The larvae of *B. vittella* mine in the tips of *P. resinosa* and *P. mugho* in May, causing the terminal half inch to bend over.

JEWETT (H. H.). **The Relation of Time of Cutting to Leafhopper Injury to Alfalfa.**—*Bull. Kentucky agric. Exp. Sta.* no. 348 pp. 51-59, 3 figs., 2 refs. Lexington, Ky, April 1934. [Recd. September 1934.]

Field experiments carried out in the summers of 1932 and 1933 in Kentucky to determine the best dates for mowing lucerne with a view to decreasing injury by *Empoasca fabae*, Harr., gave results in agreement with those obtained in Wisconsin [R.A.E., A 21 665; 22 277]. As a rule, the first crop is injured only slightly, if at all, but the second and sometimes the third are severely damaged. Adult leafhoppers appear in considerable numbers about 1st June and oviposit on the first crop. The first mowing should be delayed to about 10th-15th June, when the lucerne is generally near full bloom, but not later, as too many nymphs will have hatched after that date. If the second crop is mown during the last week of July, when the leafhoppers begin to decrease from the maximum numbers reached about 25th July, very little damage will be done to the third crop.

COWAN (F. T.). **How to control Grasshoppers.**—*Circ. Colo. Ent.* no. 59, 16 pp., 10 figs. Fort Collins, Colo., March 1934. [Recd. August 1934.]

Outbreaks of grasshoppers have occurred in Colorado at intervals of about 10 years [*cf. R.A.E.*, A 22 563] since 1900, before which authentic records are not available. As a result of extensive control measures undertaken during the last 3 years at a cost of over £14,000 [at par], the State is now comparatively free from infestation, though large populations may develop if a series of dry years occurs. A general account is given of their bionomics and their control by cultivation, the use of a hopperdozer and the application of arsenical baits, with individual notes on the major species, *viz.*, *Melanoplus bivittatus*, Say, *M. differentialis*, Thos., *M. mexicanus*, Sauss., *M. femur-rubrum*, DeG., and *Dissosteira longipennis*, Thos.

LIST (G. M.) & NEWTON (J. H.). **Recommendations for Codling Moth Control in Colorado for 1934.**—*Circ. Colo. Ent.* no. 60, 8 pp. Fort Collins, Colo., April 1934. [Recd. August 1934.]

A programme is outlined for the control of the codling moth [*Cydia pomonella*, L.] by means of lead arsenate sprays on apples and pears grown on a commercial scale that will undergo the standard washing process for the removal of residues. It is based on years of investigation and on information brought out by a recent national codling moth conference in which control was considered in the light of the residue problem [*cf. R.A.E.*, A 22 281]. No advantage has been derived from increasing the dosage of lead arsenate above  $2\frac{1}{2}$ –3 lb. to 100 U.S. gals. Although the use of spreaders has not materially improved the control in experimental plots, a uniform coverage is to be preferred, especially in the second-brood sprays, since it prevents the occurrence of spotted fruit and facilitates residue removal.

MCDANIEL (E. I.). **Michigan Termites or "White Ants."**—*Circ. Bull. Mich. agric. Exp. Sta.* no. 150, 14 pp., 8 figs., 10 refs. East Lansing, Mich., July 1934.

The only termites occurring in Michigan are *Reticulitermes flavipes*, Koll., and *R. arenincola*, Goellner, of which only the former is injurious. Notes are given on its bionomics and control, including information already noticed [*R.A.E.*, A 21 666]. Infested woodwork in houses may be treated by injecting into the cavities kerosene to which pyrethrum has been added at the rate of  $\frac{1}{2}$  lb. ground flowers per U.S. gal. Clean cultivation should be practised on the soil, and deep ploughing and crop rotation prevent the termites from becoming established. After ploughing, it may be necessary to treat the soil with chemicals, the following having proved effective: sodium cyanide (160 lb., in 12,000 U.S. gals. water, per acre); a 50 per cent. emulsion of carbon bisulphide diluted in 10 U.S. gals. water at the rate of 68, 57 and 45 cc. for use at soil temperatures of 40–50, 50–60 and 60–70°F., respectively, and applied at  $2\frac{1}{2}$  U.S. gals. per sq. ft.; kerosene, alone or with coal-tar creosote (3 : 1) or pyrethrum powder ( $\frac{1}{2}$  lb. added to 1 U.S. gal. and allowed to stand for 48 hours); and a 10 per cent. sodium arsenite solution. Kerosene or sodium arsenite should only be used if there is no vegetation to consider, but the latter is leached out of the soil in a few years. Where living trees are attacked,

the soil should be thoroughly cultivated, and commercial fertiliser should be used instead of farmyard manure. Applications of carbon bisulphide at the base of the trees in early spring will kill many of the termites. Timber to be used in building greenhouses may be protected for a time by treatment with zinc chloride, mercury bichloride, or a 10 per cent. solution of sodium arsenite. If the treated wood is painted, it retains the poison longer.

GINSBURG (J. M.). **Toxicity of Cadmium to Chewing Insects.**—*Science* **80** no. 2073 p. 269. New York, 21st September 1934.

Laboratory experiments in the United States have shown that cadmium salts are toxic to silkworms (*Bombyx mori*, L.), the oxide and the hydroxide comparing well with lead arsenate. Of larvae of *Malacosoma americana*, F., placed on apple twigs previously sprayed with cadmium hydroxide in concentrations of 1, 2 and 3 lb. to 100 U.S. gals. water, 70, 90 and 100 per cent., respectively, were killed within 48 hours. Considerable feeding took place during the first and very little during the second day. About 82 per cent. of silkworms were dead 2 days after they were placed on mulberry leaves previously dusted with a mixture of 95 per cent. talc and 5 per cent. cadmium hydroxide. Adults of *Tribolium confusum*, Duv., placed in flour mixed with 15 per cent. cadmium hydroxide were all dead after 10 days. Similar results were obtained on these insects with spray and dust mixtures containing cadmium oxide. A young apple tree on which were 2 nests of *Malacosoma* was sprayed on 18th May with 3 lb. cadmium hydroxide, 4 lb. lime and 1½ lb. skim milk in 100 U.S. gals.; 3 days later, about 90 per cent. of the caterpillars were dead and the rest were not feeding.

ELLIOT (C.) & POOS (F. W.). **Overwintering of *Aplanobacter stewarti*.**—*Science* **80** no. 2074 pp. 289–290. New York, 28th September 1934.

Investigations carried out by the authors in April 1934 in Virginia showed that the overwintered adults of *Chaetocnema pulicaria*, Melsh., which feed on young maize, harbour *Aplanobacter stewarti*, the causal agent of bacterial wilt of maize [cf. R.A.E., A **12** 120]. Healthy plants inoculated with *A. stewarti* from the macerated beetles or exposed to feeding by them all developed typical symptoms of wilt, and the bacterium was isolated from them. Preliminary isolations from 175 overwintered beetles collected from several different species of food-plants indicated that the organism was abundant in about 19 per cent. of them. It is therefore probable that *C. pulicaria* may be largely responsible for the overwintering of the disease.

HURT (R. H.). **Tar Oil Distillates as Dormant Spray Materials for Fruit Trees.**—*Bull. Va agric. Exp. Sta.* no. 293, 16 pp., 1 fig., 10 refs. Blacksburg, Va, December 1933. [Recd. August 1934.]

An account is given of experiments carried out in Virginia during 1929–33 to determine the value of spraying dormant fruit trees with emulsions of tar distillates, the sources of which are discussed, and petroleum (separately or in combination). Tar oils are very effective against the eggs of Aphids [*Anuraphis roseus*, Bak., and *Aphis pomi*, DeG.] on apple, a minimum concentration of 2.5 per cent. being

necessary for good control [*cf.* *R.A.E.*, A **22** 179]. Not less than 2 per cent. petroleum oil (having a viscosity of about 150 seconds Saybolt) may be added for the combined control of both Aphids and of the San José scale [*Aspidiotus perniciosus*, Comst.] [*cf.* **22** 323]. The emulsions should be applied to all parts of the trees when they are thoroughly dormant but when the temperature is above 40°F. and preferably above 50°F.

WATSON (J. R.). **A Pepper Pest new to the United States.**—*Florida Ent.* **18** no. 2 p. 23. Gainesville, Fla, June 1934.

Peppers [*Capsicum*] infested with weevils were received from one county in Florida in November 1931 and again in the autumn of 1933, when the species was identified as *Cryptorrhynchus cubae*, Boh. This weevil is present but uncommon on *Capsicum* in Cuba, where the pupal period lasts 10–12 days. In cages, the larvae were found tunnelling throughout the entire length of the plant, from the base up to and even including the peduncle of the fruit. They pupated in the tunnels, and the newly emerged adults punctured the petioles of the leaves (causing them to wither and drop). The plants received were so heavily infested as to be worthless commercially, and it appears that the cultivation of this crop is being discontinued on some plantations in consequence.

NAGEL (R. H.) & SHEPARD (H. H.). **The Lethal Effect of Low Temperatures on the various Stages of the Confused Flour Beetle.**—*J. agric. Res.* **48** no. 11 pp. 1009–1016, 9 refs. Washington, D.C., 1st June 1934.

In most of these experiments with *Tribolium confusum*, Duv., in the United States, the extreme temperatures tested were –18 and 7°C. [0·4 and 44·6°F.]. The following figures show the number of hours' exposure required to give 50 and (in brackets) 100 per cent. mortality at these temperatures, respectively: eggs, 0·25 (1) for those of all ages, and 43 (216), 214 (432) and 110 (288) for those aged 1–24, 48–72 and 120–132 hours, respectively; unfed larvae 1–12 hours old, 0·18 (1) and 134 (288); full-grown (sixth-instar) larvae, 0·17 (0·5) and 197 (528); pupae (as shown by adult emergence), 0·13 (0·5) and 258 (432); adults 1–5 months old, 0·15 (0·5) and 336 (528). Exposure for 25 days to 44·6°F., or for 24 hours to –6°C. [21·2°F.], gave 100 per cent. mortality of all stages.

PARKER (J. H.) & PAINTER (R. H.). **Insect Resistance in Crop Plants.**—*Proc. int. Congr. Genetics* **6** (1932) 2 pp. 150–152.

Recorded instances of resistance to injury by insects exhibited by certain varieties of otherwise susceptible plants or by species closely allied to them are reviewed, and special reference is made to work done on this subject in Kansas [*cf.* *R.A.E.*, A **14** 158; **20** 43].

HALL (J. A.). **Observations on the Behaviour of newly hatched Codling Moth Larvae.**—*Canad. Ent.* **66** no. 5 pp. 100–102. Orillia, May 1934.

Newly hatched larvae of the codling moth [*Cydia pomonella*, L.] observed on apple in Ontario wandered on leaves and fruit in a haphazard manner for an average of 84 minutes without feeding. At

60–70°F., they moved at a rate of about 1 inch a minute on unsprayed material and about  $\frac{1}{2}$  inch on material sprayed with 2 lb. lead arsenate to 40 gals. water. They avoided bright sunlight and always made their way to the lower surface of the foliage. They avoided adhesive bands, but were undeterred by lead arsenate residue. Some lived up to 30 days on leaves only (where they fed on or close to the larger veins), but none survived to maturity. Those that had fed on the leaves for up to 7 days (the longest period tested in this connection) were capable of establishing themselves in the fruit, though out of a total of 60 only 2 were found alive on this date. All succumbed within 20 hours on sprayed leaves. The larvae apparently locate the fruit by chance; of 85 placed on leaves 2–12 inches from apples, only 37 succeeded in finding the latter. Practically no activity occurs at 50°F., and the number entering the apples increases directly with the rise in temperature until the optimum is reached. The condition of the fruit appears to influence infestation, as picked apples were more easily entered than those still on the tree. Entrance may be effected at any point on the surface and for 25 larvae took an average of 70·8 mins., though the time varies with the temperature and the physical condition of the apple. The larvae spin a few strands of silk to give themselves a footing. In the laboratory 75 and in the field apparently 60–70 per cent. entered in the area exposed to direct light.

**Specifications and Methods of Analysis for certain Insecticides and Fungicides.**—*Bull. Minist. Agric.* no. 82, 10 pp. London, H.M.S.O., July 1934. Price 3d.

This bulletin contains the specifications drawn up by the Association of British Insecticide Manufacturers [*R.A.E.*, A 22 436], together with agreed methods of analysis of the various chemicals.

**ROEBUCK (A.). Insect and allied Pests recorded in the Midland Province (Crop Pests and Indoor Pests 1922 to 1934).**—*Bull. Midl. agric. Coll.* no. 32, 33 pp. Sutton Bonington, Loughborough, 1934.

Numerous Arthropods are included in this annotated systematic list, which indicates local distribution, food-plants, etc., of agricultural and household pests recorded between the autumn of 1922 and the spring of 1934 from various counties in the English Midlands.

**LAL (K. B.). Insect Parasites of Psyllidae.**—*Parasitology* 26 no. 3 pp. 325–334, 4 figs., 17 refs. Cambridge, 17th August 1934.

A list is given, supplementing that of Waterston [*R.A.E.*, A 10 391], of records of insects parasitising Psyllids. Those attacking the adults are all Cecidomyiids, and of those attacking the nymphs all but one are Chalcidoids.

Of four species of *Psylla* (*Psyllia*) the biology of which was studied in Scotland, only *P. peregrina*, Först. (which the author regards as a race of the apple sucker, *P. mali*, Schm., although it occurs only on hawthorn (*Crataegus*) and cannot be reared successfully on apple) was fairly heavily parasitised. The adults are found in the field from

about the end of May until the first week in October. Pairing begins in the last week in August, and the eggs, which are laid on the food-plant a few days afterwards, hatch early in April. In the first two instars, the nymphs feed gregariously on the half-opened leaf-buds; later, they feed singly on the lower surface of the leaves and on the petioles, secreting little tubes of a white waxy substance. The nymphal stage lasts about 7 weeks.

A Scelionid, *Platygaster* sp., was occasionally reared from the nymphs, and *Prionomitus mitratus*, Dalm., parasitised 20–30 per cent. of them. Nymphs parasitised by this Encyrtid occur in the field from the first week in June to mid-September, and may be recognised by their bloated appearance and deep brown colour. The adult parasite emerges through a round hole in the abdomen. It is possible that this stage overwinters. The Calliceratid, *Lygocerus semiramus*, Kieff., the egg and adult female of which are described, was apparently a hyperparasite of *Prionomitus* [cf. R.A.E., A 8 146], and the Pteromalids, *Asaphes vulgaris*, Wlk., and *Pachyneuron* sp., were probably hyperparasites of the Psyllid nymphs.

An unnamed Cecidomyiid of the genus *Endopsylla*, all stages of which are described, parasitised from 20 to 40 per cent. of the adults of *P. peregrina*, the incidence of parasitism being higher in females than in males. It also attacked *P. mali*, *P. melanoneura*, Först., and *P. pyricola*, Först. The eggs were laid singly on the fore-wings of *P. peregrina* during June–August. The larvae hatched in 8–13 days and crawled to the body of the host, where they fed for 3–4 days as ectoparasites; they then bored into the haemocoel, which they left 6–10 days later, afterwards living for 1–2 days on hawthorn leaves before dropping to the ground to pupate. The pupal stage lasted about 6 days in early autumn. The first adults reared in the laboratory appeared early in July, but as the eggs were found long after this it is possible that a second generation occurs. The parasitised Psyllids soon become sluggish, but they did not change colour.

The only parasite bred from *Psyllopsis fraxinicola*, Först., was the Encyrtid, *Cercobelus jugoeus*, Wlk.

THOMPSON (W. R.). **The Tachinid Parasites of Woodlice.**—*Parasitology* 26 no. 3 pp. 378–448, 8 pls., 5 figs., 30 refs. Cambridge, 17th August 1934.

The literature on the Dipterous parasites of the terrestrial Isopods is reviewed, all the certainly recorded species being Tachinids of the subfamily RHINOPHORINAE. During the course of studies carried out between 1907 and 1931 in various localities in France and England on 8 species of woodlice, parasites were found only in *Porcellio scaber*, L., *Oniscus asellus*, L., and *Metaparonorthus pruinosus*, Brandt, which occur in both countries. *Phyto melanocephala*, Mg., has been recorded from *Armadillidium vulgare*, Latr., in England. The larval forms are described of the following parasites: *Plesina maculata*, Fall., *Melano-phora roralis*, L., *Phyto melanocephala*, *Styloneuria discrepans*, Pand., and *Frauenfeldia rubricosa*, Mg., all reared from *Porcellio scaber*; and *Cyrrillia angustifrons*, Rond., reared only from *M. pruinosus* in south-western France. One adult of *Rhinophora lepida*, Mg., was found, together with *F. rubricosa*, in a cage containing examples of *P. scaber* from north-western France. *Plesina maculata* and *S. discrepans*

occasionally parasitise *O. asellus*. These species are classified into three main groups, chiefly according to the structure of the bucco-pharyngeal armature of the first instar.

The adults of *Plesina maculata* have been taken in Britain in July–September, those of *R. lepida* and *S. discrepans* in July and August, those of *M. roralis* in June, and those of *Phyto melanocephala* in September. As none of the species appears to have more than one generation a year and laboratory experiments have not shown any of them to be particularly long-lived, the appearance of the adults in the field over a considerable period is probably due to the wide variation in the duration of larval development (dependent mainly on the conditions under which the host is living) and consequently in the date of adult emergence. *Plesina maculata*, *S. discrepans* and *M. roralis* paired readily in small glass cages. It is suggested that the parasites of woodlice deposit undeveloped eggs in crevices of the bark or edges of stones under which colonies of the host are assembled. The probable method of entry of the parasite larva into the host and its mode of attachment and respiration are discussed. By far the greater part of the larval life is spent in the second instar, in which all species hibernate with the exception of an unidentified one, which has been observed to pass the winter in small hosts as a first-instar larva. During the first two instars, the larvae appear to feed on the blood of the host, increasing very slowly in size. On reaching the third, they begin to attack the tissues and organs and grow rapidly. Pupation occurs within the empty skin of the host.

The nature of the diapause in Tachinid parasites of hibernating insects is discussed. Under normal conditions, development proceeds slowly in summer and autumn, is interrupted by the winter and completed only in late spring. From woodlice brought indoors early in December, however, and kept in a warm room with food and moisture, adult flies were obtained as early as the middle of January, when female woodlice bearing eggs were also found.

The effect of parasitism on the host, the phagocytic reaction of the latter, and the extent to which these parasites have become morphologically adapted to their hosts are discussed. The data suggest that parasitism depends mainly on the habits of the host, and that any species might be parasitised if it lived in large colonies under the loose bark of logs and fallen trees as does *P. scaber*. Of 1,737 examples of *P. scaber* and *O. asellus* collected in 18 different localities in England and France, only 9.1 per cent. were parasitised, and of the latter alone only 3.1 per cent. The highest percentages noted were 7.2 of *O. asellus* and 25.2 of *P. scaber* in localities in England where several species of parasites were represented. If, as appears probable, natural control of woodlice is effected chiefly by a high mortality (partly due to cannibalism) in the early stages, many parasites will die with their hosts, and although an increase in population density might be favourable to larvae obliged to go in search of their prey, this advantage will be offset by the rise in the general death rate of the young woodlice in crowded conditions. Thus parasites would not appear to be necessary for the control of gregarious woodlice such as *P. scaber*, *M. pruinosis* and *O. asellus*, and they would be even less effective against solitary or wandering species. Factors governing seasonal and local fluctuations in parasitism are discussed.

The Ichneumonid, *Phygadeuon vexator*, Thnb. (*dumetorum*, Grav.) was reared from the puparium of a parasite of *Porcellio* in England.

THOMPSON (W. R.). **The Development of a Colony of *Aphelinus mali* Hald.**—*Parasitology* **26** no. 3 pp. 449–453, 1 graph, 2 refs. Cambridge, 17th August 1934.

On an apple tree in England heavily infested with *Eriosoma lanigerum*, Hsm., the total number of the Aphids being estimated on 10th June 1933 at about 112,000, all apparently unparasitised, three twigs each bearing 100 dead Aphids parasitised by *Aphelinus mali*, Hald., were fastened to the three main branches on 13th June. On 16th June, practically all the parasites had emerged. A graph shows the percentage parasitism of batches of Aphids dissected at intervals of about 3 days from 20th June to 18th August, when all those examined were parasitised. A new estimate of the host population, made on 28th June after several torrential downpours of rain, showed it to have increased to about 135,000. Calculations show that the observed reduction of the initial population almost to zero was possible on the basis of the known reproductive rate of *A. mali*. The actual percentage of parasitised hosts was in excess of the theoretical one, possibly owing to a tendency on the part of *A. mali* to avoid ovipositing in parasitised hosts [cf. *R.A.E.*, A **22** 204]. Until the percentage of parasitism reached 4, no hosts were found to contain more than a single parasite larva. From this point onward, one or more hosts in every sample dissected contained two or more larvae of the parasite.

As previous experiments, however, indicate that under English conditions the Aphelinid is not able to keep the Aphid permanently at a low level, these satisfactory results may have been due partly to the increase of the Aphids having practically ceased by the time that the parasite was introduced and to the prevalence of climatic conditions favourable to the latter. An earlier introduction would probably have given less striking results.

MESNIL (L.). **Invertébrés nuisibles aux céréales observés en France.**—*Arq. Secç. Biol. Mus. zool. Univ. Coimbra* **2** no. 2 pp. 81–92. Coimbra, 1933. [Recd. September 1934.]

This list includes records of over 60 insects and mites occurring on cereals in France, with brief notes on the bionomics of the more important ones.

MASERA (E.). **Setticemia nelle larve di *Tenebrio molitor* L.**—*Riv. Biol.* **16** no. 3 pp. 509–517, 1 fig., 10 refs. Florence, 1934.

When larvae of *Tenebrio molitor*, L., were kept at 37°C. [98.6°F.] or 0°C. [32°F.], considerable mortality resulted; the septicaemia caused by these unfavourable temperatures may be a flacherie. Starvation did not produce this symptom. The effect of different humidities was not tested.

JANNONE (G.). **Osservazioni ecologiche e biologiche sul *Dociostaurus maroccanus* Thunb., *Calliptamus italicus* L. e loro parassiti in Provincia di Napoli (Primo contributo).**—*Boll. Lab. Zool. Portici* **28** pp. 75–151, 15 figs., 26 refs. Portici, 6th June 1934.

A preliminary study was made of areas in Italy, mainly in the Province of Naples, typical of those usually invaded by swarms of

*Dociostaurus maroccanus*, Thnb., and *Calliptamus italicus*, L. Their geographical features, soils, vegetation and Orthopterous communities are described in detail, and the climate is analysed with regard to the annual cycle of the two species. In laboratory experiments, eggs of both could be made to hatch in January or February by keeping them moist at temperatures fluctuating between 16°C. [60·8°F.] (night) and 40°C. [104°F.] (day).

The bionomics and ecology of both species are described. The egg-pods of *Dociostaurus* are parasitised by the Meloids, *Mylabris variabilis*, Pall., with its var. *lacera*, Fisch., and *Epicauta rufidorsum*, Goeze (*erythrocephala*, Rossi), and the Bombyliids, *Cytherea* (*Glossista*) *infuscata*, Mg., and *Systoechus ctenopterus*, Mik., and the hoppers and adults by the Sarcophagid, *Blaesoxipha* (*Gesneriodes*) *lineata*, Fall., from which the Chalcid hyperparasite, *Brachymeria fonscolombeii*, Duf., was reared. The parasites of *C. italicus* are the same (excluding *S. ctenopterus*), with the addition of the Meloid, *Lydus trimaculatus*, F., which destroys the egg-pods. *Eutrombidium trigonum*, Herm., spiders, lizards, frogs and birds attack both locusts.

GOIDANICH (A.) & GOIDANICH (G.). **Lo Scolytus sulcifrons** **Rey** (Coleoptera-Scolytidae) **nella diffusione del pirenomicete Ceratostomella (Graphium) ulmi (Schwarz) Buis. nell'Emilia.** [*S. sulcifrons* and the Spread of *C. ulmi* in Emilia.].—*Bol. Lab. Ent. Bologna* **7** pp. 145–163, 2 figs., 5 pls., 9 refs. Bologna, 10th August 1934.

In Emilia, Italy, where the disease of elm, particularly *Ulmus procera* (*campestris*) and *U. americana*, due to *Ceratostomella* (*Graphium*) *ulmi* has recently been observed, trees of this genus are attacked by *Scolytus sulcifrons*, Rey, and less frequently by *S. multistriatus*, Marsh. *S. sulcifrons* hibernates in the larval stage, the adults emerging in April and May. They occupy feeding mines in May and June, and the females excavate the brood mines in June and sometimes July. In July there occur eggs, larvae and pupae, and even some new adults at the end of the month. These probably emerge in August and give rise to the hibernating generation. The mines are described. The Colydiid, *Aulonium trisulcum*, Geoff., preys actively on the larvae and pupae. Adults of *Hypophloeus bicolor*, Ol., were found in the mines in April and July, and larvae in July. This Tenebrionid may be saprophagous, though in a single experiment a larva killed a pupa of *S. sulcifrons*.

The mines of *S. multistriatus* somewhat resemble those of *S. sulcifrons*. The larvae hibernate, and the adults emerge in April and May and occur in feeding mines in June and July. *Cheirapachys colon*, L., a Cleonymid ectoparasite of the larvae and pupae, was reared in late May; the adults issue from the mines by piercing the elm bark.

The larval mines of the Scolytids killed weak trees, and healthy trees were also sometimes attacked. Injury to growth resulted from the excavation of living tissue caused by the feeding of the adults, and twigs were withered. *C. ulmi* was found repeatedly in trees without any lesions except those of *S. sulcifrons*, and in some trees the first internal signs of the disease were seen in the feeding mines. Its incidence was correlated with that of the Scolytids, and it is concluded that it is spread by the adults. The larval mines under the bark also favour the formation of spores by the fungus:

Measures suggested for control are the careful removal and burning of the bark of dead and diseased trees [cf. *R.A.E.*, A 21 172] and the use of trap logs to attract the ovipositing females.

BENLLOCH (M.) & DEL CAÑIZO (J.). **La fumigación de olivos con cianuro de calcio para combatir el *Liothrips oleae*, Costa.** [The Fumigation of Olive Trees with Calcium Cyanide against *L. oleae*.]—*Bol. Pat. veg. Ent. agric.* 7 no. 27-30 pp. 54-59, 4 figs. Madrid, 1934.

In connection with tent fumigation with hydrocyanic acid gas against *Liothrips oleae*, Costa, on olives in Spain, an account is given of the method of using the American dust "Cyanogas" containing 40-50 per cent. of calcium cyanide, and the German "Calcid," which was found to contain 82.49 per cent. The latter is supplied in 20-gm. tablets that are pulverised by a crusher incorporated in the blower. The powdered Calcid was not, however, so fine a dust as Cyanogas, the defect being due to excessive hardness of the tablets and the speed at which they were crushed. In consequence, softer tablets and a more powerful blower have since been made available.

BERRO (J. M.). **La *Antispila rivillei* (Stt.) en los parrales de Almería.** [*A. rivillei* in the Vineyards of Almería.]—*Bol. Pat. veg. Ent. agric.* 7 no. 27-30 pp. 60-68, 8 figs., 16 refs. Madrid, 1934.

*Antispila rivillei*, Stn., all stages of which are briefly described, has apparently not been recorded as a pest of grape-vines in Spain, though it has evidently been long established on them in Almería. The moths emerge in spring from the hibernated pupae and oviposit in the veins of the vine leaves. The larva pierces the epidermis and mines in the parenchyma, the leaf becoming discoloured as the mesophyll is destroyed. The pupal stage is passed in a leaf-envelope made by the larva, which drops in it by a thread so as to be blown to a vine stock [*R.A.E.*, A 15 203], where it fastens itself with silk between ridges on the bark. If it fails to reach a stock, it descends to the ground and burrows just below the surface. This Tineid is not an important pest, as it is largely controlled by the Eulophid parasites, *Entedon antispilae*, Rond., and *E. rivillellae*, Rond.

GÓMEZ CLEMENTE (F.). **Los parásitos de la *Ceratitis capitata*, Wied. Nuevos ensayos de importación y aclimatación.** [The Parasites of *C. capitata*. New Attempts at Importation and Acclimatisation.]—*Bol. Pat. veg. Ent. agric.* 7 no. 27-30 pp. 69-80, 4 figs., 13 refs. Madrid, 1934.

Further attempts [cf. *R.A.E.*, A 21 304] to introduce the Braconids, *Opius humilis*, Silv., and *Diachasma tryoni*, Cam., from Hawaii, for use against *Ceratitis capitata*, Wied., in Valencia were made in 1932 and 1933. In 1932, 172 males and 1 female were bred from the survivors from Hawaii and this female had a progeny of 12 males. In 1933, 1,787 larvae of *C. capitata* were exposed to the Braconids and from these were bred 63 males and 16 females of *D. tryoni*, 167 males and 6 females of *O. humilis*, and 616 adults of *C. capitata*. The failure of the remaining 919 larvae of the fruit-fly to develop may have been due to the action of the parasites, in view of the observation by Pemberton and Willard that the mere deposition of

several parasite eggs often kills the host larva [6 185]. The almost exclusive occurrence of males may have been due to the long journey having affected the fertilisation of the female parents.

The extremes of temperature in Spain render it doubtful whether these imported parasites can become established. It is suggested that they could more easily be acclimatised at Las Palmas in the Canary Islands, where the temperature variations are similar to those in Hawaii.

**BENLLOCH (M.).** **Experiencias de desinfección de frutas por el calor.** [Experiments in the Treatment of Fruits by Heat.]—*Bol. Pat. veg. Ent. agríc.* **7** no. 27–30 pp. 81–90, 9 figs. Madrid, 1934.

A detailed account is given of experiments made by a Spanish commission in the treatment of grapes (in cork dust) and oranges by heat. The fruits were placed on shelves in an insulated cupboard standing on a base containing a tank of water with electric immersion heaters, a blower and a series of baffle plates ensuring thorough mixing of the heated, moisture-saturated air. A treatment temperature of 43.5°C. [110.3°F.] was obtained in the cupboard, and the temperature within the oranges (but not the grapes) could be maintained at this point or a little higher. These preliminary experiments indicate the possibility of applying the method, with certain modifications, against the larvae of *Ceratitis capitata*, Wied.

**DEL CAÑIZO (J.).** **Dos Agromíscidos perjudiciales al garbanzo.** [Two Agromyzids harmful to the Chick-pea.]—*Bol. Pat. veg. Ent. agríc.* **7** no. 27–30 pp. 91–103, 10 figs., 6 refs. Madrid, 1934.

The larvae of *Liriomyza cicerina*, Rond., and *Phytomyza affinis*, Mg., mine in the leaves of chick-peas [*Cicer arietinum*] in Spain and sometimes check the growth of the plants sufficiently to cause a loss of crop.

All stages of *L. cicerina* are described, with notes on its synonymy. It has been recorded from chick-peas in Italy and *Ononis* spp. in Central Europe. The author found the adults in the field in April, puncturing the leaves and feeding on the exudate. The eggs were laid in the leaf-tissue, and the pupal stage was passed in the larval leaf-mine, adults again appearing in June. In 1932, nearly 90 per cent. of the larvae were parasitised by a Braconid that usually causes the second generation to be unimportant. *P. affinis* was usually found on *Cirsium arvense* and was much less common on chick-pea than *L. cicerina*; it also pupated in the leaf-mine.

It is suggested that the adults of both species may be killed by a bait-spray of 2½–3 lb. sodium fluosilicate, 40–50 lb. molasses (or 20 lb. brown sugar) and 100 gals. water. The spray should be applied to one of every three or four rows of plants at the end of April, followed by other applications at 10–15 day intervals. The destruction of plants of the genus *Ononis* is advisable.

**GÓMEZ CLEMENTE (F.).** **El gorgojo de los ajos** (*Brachycerus algirus*, Fab.) [The Garlic Weevil.]—*Bol. Pat. veg. Ent. agríc.* **7** no. 27–30 pp. 104–114, 7 figs., 14 refs. Madrid, 1934.

*Brachycerus algirus*, F., occurs in Valencia where garlic is grown and some wild Liliaceae are found, but causes little damage. In one instance, adults collected in April had probably been derived from

eggs laid in autumn on *Tulipa clusiana*. Garlic bulbs examined in July after harvesting contained larvae only. Adults were found in stored garlic in autumn and were also seen in the field in winter. Infested bulbs reached their normal size, but were completely destroyed internally.

Control measures should be practised with a view to avoiding infestation in exported garlic. Bulbs found infested in storage must be destroyed. The weevils may be trapped in trenches dug round fields liable to infestation, or the fields may be flooded repeatedly before sowing. Garlic should not be grown in infested fields for 3-4 years. Treatment of infested bulbs is only of value to prevent the spread of infestation by them. The larvae proved very resistant to heat, but exposure for one hour to 65-70°C. [149-158°F.] killed most of them.

BENLLOCH (M.) & DEL CAÑIZO (J.). **Las plagas de *Aglaope infausta* L.** [The Attacks of *A. infausta*.]—*Bol. Pat. veg. Ent. agric.* **7** no. 27-30 pp. 115-129, 13 figs., 12 refs. Madrid, 1934.

The Zygaenid, *Aglaope infausta*, L., all stages of which are described, is one of the most serious orchard pests in Spain. It occurs wherever almonds are grown, but also attacks other stone fruits and to a less extent pip fruits. The adults appear in spring and oviposit on the trunks and branches. The larvae hatch at the end of spring or in summer, but only feed on the leaves for a few days and then migrate to the rough bark, where they remain inactive through the autumn and winter. They resume feeding at the end of winter or in spring and pupate in sheltered positions on the trees, the pupal stage lasting 15-20 days. The larvae feed on the parenchyma of the leaves without touching the veins.

The Tachinids, *Compsilura concinnata*, Mg., and *Tricholyga segregata*, Rond., and the Ichneumonid, *Spilocryptus solitarius*, Tschek, have been reared from the larvae by the authors.

Control is effected in winter by spraying with lime-sulphur after scraping the bare trunk and branches, and in spring a spray containing 8-10 lb. lead arsenate in 100 gals. water is often used. This high concentration is necessary as the larvae are very resistant to arsenicals, though 4 lb. lead arsenate has proved effective when 40 lb. of molasses have been added as a spreader to the 100 gals. water.

HERCE (P.). **La concentración de ácido cianhídrico en los recintos fumigados.** [The Concentration of Hydrocyanic Acid Gas in fumigated Spaces.]—*Bol. Pat. veg. Ent. agric.* **7** no. 27-30 pp. 155-165, 2 figs. Madrid, 1934.

An apparatus is described for taking samples of the concentration of hydrocyanic acid gas during fumigation and for repeating this sampling at short intervals.

A cylindrical glass container is marked at intervals of 200 cc. to a total of 1,000 cc. The zero point is at the top of the scale, and above it there is a space of about 400 cc. The top of the container is connected by rubber tubing to a horizontal glass tube from the other end of which another length of tubing leads into the fumigation space. On each side of a glass tap in the middle of this horizontal glass tube is a vertical branch. Both these vertical tubes are fitted with glass taps and pass down through a stopper into a test-tube

An amount of water equal to the capacity of the rubber tubing between the glass tube and the fumigation space is added to 1,000 cc. water in the container through an orifice at the top of the latter. The orifice is then closed, and this additional amount of water is run out through a tap at the bottom of the container. This draws the air out of the tubing and replaces it by the gas mixture, the horizontal tube being open and the two vertical ones closed to prevent any of this mixture entering the test-tube. When a sample of gas is desired, 200 cc. of water is run out, the tap on the horizontal glass tube being closed and those on the vertical branches open. This draws 200 cc. of the mixture into the test-tube, where it bubbles in a solution of sodium bicarbonate that retains the HCN. The test-tube is then removed, stoppered, and replaced by another for the next sample. In practice, a battery of 4 containers and 4 test-tubes was arranged.

A method of analysing the samples is also described.

HERCE (P.). **El arsénico soluble de los insecticidas arsenicales.** [The Soluble Arsenic in Arsenical Insecticides.]—*Bol. Pat. veg. Ent. agric.* **7** no. 27–30 pp. 167–168. Madrid, 1934.

In commercial arsenical compounds, the soluble arsenic is present in both trivalent and pentavalent forms. It is usual to express the trivalent as a percentage of  $As_2O_3$  and the sum of the trivalent and pentavalent as a percentage of  $As_2O_5$ , but if this is done a comparison of the quantities of the two forms of arsenic involves troublesome arithmetical calculation. Such calculation may be avoided by expressing as As the water-soluble percentages of the total arsenic and of the trivalent, the difference being the percentage of the pentavalent.

DEL CAÑIZO (J.). **El alacrán cebollero de las huertas.** [The Mole-cricket.]—*Bol. Pat. veg. Ent. agric.* **7** no. 27–30 pp. 173–180, 5 figs. Madrid, 1934.

A brief account is given of the bionomics of the mole-cricket [*Gryllotalpa gryllotalpa*, L.] in Spain and of various measures against it, particularly the poison-baits advocated by Malenotti [*R.A.E.*, A **20** 257, etc.].

BOSHART (K.). **Die Krankheiten und Schädlinge der wichtigsten Arznei- und Gewürzpflanzen.** [The Diseases and Pests of the most important Medicinal and Spice Plants.]—*Nachr. Schäd.-Bekämpf.* **9** no. 2 pp. 58–82, 6 figs., 3 pp. refs. Leverkusen, August 1934. (With Summaries in English, French & Spanish.)

Very brief notes on the recorded pests of about 40 medicinal and spice plants cultivated in Germany and neighbouring countries are given under the plants.

BÖHME (R. W.). **Das Vorkommen von Viroten auf dem Dahlemer Versuchsfelde.** [The Occurrence of Viruses in the Experimental Field at Dahlem.]—*Arb. biol. Reichsanst.* **21** no. 1 pp. 1–58, 20 figs., 22 refs. Berlin, December 1933. [Recd. August 1934.]

In investigations at Dahlem (Berlin) of the viruses causing degeneration of potato, two forms that are regarded as strains of the "x" and "y" mosaic viruses [*R.A.E.*, A **20** 63] were frequently transmitted by grafting, but only the latter was transmitted (to potato and tobacco)

by *Myzus persicae*, Sulz. This Aphid failed to transmit a mosaic disease from beet to potato or tobacco. Besides potato leaf-roll [cf. R.A.E., A 22 386], it transmitted an unknown virus of tobacco. A disease of *Capsicum* (? cucumber mosaic), which was spread to uninfected plants by *M. persicae*, was transmitted to tobacco by inoculation of sap from the leaves. The symptoms of the "y" virus in different varieties of potato and in other solanaceous plants are discussed. During the year, it spread considerably in the field, apparently owing to an outbreak in June and July of a large, green Aphid thought to be *Macrosiphum solanifolii*, Ashm. (*gei*, auct.), which was far more abundant on the rolled potato leaves than *Myzus persicae*.

VON TUBEUF (C.). *Epiblema*-(**Wicklerräupen**)-Schaden an **Fichtenknospen**. [Injury to Spruce Buds by Larvae of *Eucosma*.]—*Z. PflKrankh.* 44 no. 9 pp. 433–443, 9 figs. Stuttgart, 1934.

In May 1934, shoots of young spruce trees from German Silesia of which all the previous year's buds had been killed had a circular hole at the base apparently caused by the Tortricid, *Eucosma* (*Epiblema*) *nigricana*, H.-S.

KADOCSA (G.). **Madige Iris-Blütenknospen**. [Flower-buds of Iris infested by Maggots.]-*Z. PflKrankh.* 44 no. 9 pp. 444–447, 4 refs. Stuttgart, 1934.

Numerous instances of infestation of the flower-buds of different varieties of *Iris* by Dipterous larvae have occurred of recent years in Hungary, but the author has failed to find similar records in the literature. The buds remain closed and become soft, decomposition beginning inside and spreading outwards. On different occasions, *Muscina stabulans*, Fall. [R.A.E., A 18 323], *Fannia canicularis*, L., and *Anthomyia pluvialis*, L., have been reared from such bulbs. All three flies are common in Hungary. This suggested that the odour of decaying leaves that is peculiar to the buds attracts the first flies to oviposit on them and that the resultant decomposition attracts others.

ZWÖLFER (W.). **Zur Nonnen-Prognose**. [On the Prediction of Nun Moth Abundance.]-*Forstl. WSchr. Silva* 1933 p. 121. (Abstr. in *Z. PflKrankh.* 44 no. 9 p. 466. Stuttgart, 1934.)

For making forecasts in Germany of the probable degree of infestation by the nun moth [*Lymantria monacha*, L.], estimates of the average numbers of pupae of each sex to a pine trunk and the average weight of the female pupae are necessary. An average weight of 0.4 gm. indicates about 100 eggs per female. If the percentage and average weight of the female pupae are high, an increase in infestation is probable.

SACHSSE (H.). **Der graue Lärchenwickler im Erzgebirge**. [The Grey Larch Tortrix in the Erzgebirge Region.]-*Sudetendtsch. Forst- u. Jagdztg* 1933 pp. 25, 43, 54, 72. (Abstr. in *Z. PflKrankh.* 44 no. 9 pp. 466–467. Stuttgart, 1934.)

An account is given of the infestation of spruce in Czechoslovakia by *Enarmonia* (*Epinotia*) *diniana*, Gn. [R.A.E., A 19 325]. In some (851) [A]

years, most of the larvae cease to feed because they do not grow and moult rapidly enough to keep up with the advance in development of the shoots. In addition to the latter, the larvae also feed on the female flowers, so that deformed cones result. The eggs are laid in batches of 2-10.

EIDMANN (H.). **Der Einfluss alternierender Temperaturen auf die Eierraupe der Forleule (*Panolis flammea* Schiff.) nebst Bemerkungen über die epidemiologische Bedeutung dieses Stadiums.** [The Influence of alternating Temperature on the First-instar Larva of the Pine Noctuid, with Notes on the Importance of this Instar in Outbreaks.]—*Forstwiss. Zbl.* 1933 p. 185, 3 figs. (Abstr. in *Z. PflKrankh.* **44** no. 9 p. 467. Stuttgart, 1934.)

From experiments in Germany, the author concludes that the duration of development and rate of mortality of the first-instar larva of *Panolis flammea*, Schiff., are not materially affected by regular periodic variations of temperature within the vital zone. In this instar, the larva is very sensitive to touch, and incorrect handling may cause an abnormal mortality. By boring into the May shoot, it protects itself against rain or lack of humidity. The importance of the first instar as a critical stage in connection with outbreaks [cf. *R.A.E.*, A **21** 529] has been greatly exaggerated.

WIESMANN (R.). **Der Steinfruchtfresser (*Anthonomus rectirostris* = *A. druparum*), ein eigenartiger Kirschenschädling.** [*A. rectirostris*, a peculiar Pest of Cherry.]—*Schweiz. Z. Obst- u. Weinbau* 1933, p. 163. (Abstr. in *Z. PflKrankh.* **44** no. 9 pp. 469-470. Stuttgart, 1934.)

In 1932, losses of cherries in Switzerland due to damage by *Anthonomus rectirostris*, L., varied from 7 to 81 per cent. The adults bore mines in the green fruits for maturation feeding and oviposition, and the larvae and pupae can be found in the stones in July. The larva gnaws a circular hole in the hardening stone for adult emergence. In the laboratory, the adults skeletonised cherry leaves up to the upper epidermis.

**Report of the Activities of the Hygienic Institute in Zagreb and Organisations dependent on it in 1932.** [In Serbian.]—*Socij.-med. Pregl.* **5** no. 1-2 pp. 28-60. Belgrade, 1934.

In a section of this report (pp. 43-44), N. Baranov briefly surveys work carried out on insect pests in Jugoslavia in 1932. *Aphelinus mali*, Hald., has been liberated in a number of localities against *Eriosoma* (*Schizoneura*) *lanigerum*, Hsm., with much success and has completely eliminated the Aphid from some apple orchards in Zagreb [cf. *R.A.E.*, A **20** 316]. Pests studied on the island of Pago included *Dacus oleae*, Gmel., and *Prays oleellus*, F., on olives.

[VEBER (Ya. Kh.). Бебер (Я. Х.). **The Meadow Moth, *Loxostege sticticalis* L., in the Middle Volga Region in 1929-1930.** [In Russian.]—Demy 8vo, 48 pp. 2 graphs, 1 fldg map, 30 refs. Samara, OGIz, 1932. (With a Summary in German.) [Recd. September 1934.]

A detailed account is given of the occurrence of *Loxostege sticticalis*, L., in the Middle Volga Region in 1929 and 1930, when an unusually

severe outbreak took place in European Russia [*R.A.E.*, A **22** 469]. In each year, the females of the second generation, which were on the wing in August, were sterile. In 1929, the damage to lucerne, clover, sunflowers, beet, hemp, vegetables, fruit trees and grasses was estimated at over 3½ million roubles, but in 1930 the loss amounted to only 1 per cent. of this figure. In 1929, the adults suddenly appeared in May in enormous numbers, the mass flight usually lasting 10–11 days. The larvae were very abundant in June, developing in an average of 18–20 days. The adults of the first generation emerged in late June and early July; they were less numerous than those in the spring, and many of them required 2–3 weeks or more to mature their ovaries. This appeared to be due to heat and drought and not to lack of food for the moths. The larvae of the second generation were much less abundant, and the adults, which emerged in August, developed their ovaries very slowly, again as a result of heat and drought, and did not oviposit. About 20–25 per cent. of the larvae of the second generation and a few of those of the first hibernated and in the following May gave rise to fertile adults. The first-brood larvae were less numerous than in 1929, but the adults appeared in the first half of July in enormous numbers, though most of the females had immature ovaries and development was slow. The larvae of the second generation were fairly abundant, but concentrated on weeds, which had developed after abundant rains. The adults were on the wing in August, but though fertile, they did not oviposit owing to cold weather and winds.

The part played by wind in the distribution of the moths is discussed at some length. Observations showed that the migrations are passive and their course alters with the wind, the moths being usually carried at a height of 3–7 ft. Their sudden appearance in various districts was undoubtedly due to wind, which carried them from adjoining areas, and especially from permanent breeding foci in south-eastern Russia [*cf.* **22** 467]. The moths that appear in spring tend to concentrate on crops to a greater extent than those of subsequent generations, since the latter occur when the flowering of most of the crops is over. Pathological changes in the ovaries of the females were only observed in 1930 and in the eastern and north-western parts of the region, and the percentage of affected individuals was low. The larvae were parasitised by 6 species of Hymenoptera and 3 of Diptera, but their numbers were not appreciably reduced.

The chief control measures practised consisted of hand-collection of the larvae, and preventing them from migrating by trenches (of which about 450 miles were made), ploughed strips of soil, etc. The insecticides used included sprays of barium chloride, tobacco extract, kerosene emulsion or Paris green and lime. The last spray was the one chiefly used, but it was less effective than the others.

[VEBER (Ya. Kh.) & EROFEEV (P. V.). Вебер (Я. Х.) и Ерофеев (П. В.). **Chemical Control of agricultural Pests.** [*In Russian.*].—Cr. 8vo, 80 pp., 21 figs. Samara, OGIZ, 1933. Price 75 коп. [Recd. September 1934.]

This popular handbook comprises a brief approximate estimate of the losses caused to cereal and vegetable crops in the Middle Volga Region by diseases and various pests (of which only the popular names are given), with notes on the biology and chemical control of the more important ones and on the properties and preparation of insecticides.

[BEĬ-BIENKO (G. Ya.).] **Бей-Биенко (Г. Я.). Manual for the Locust Record Service.** [In Russian.]—La. Cr. 8vo, 195 pp., 28 figs., 14 refs. Leningrad, Ass. Contr. Pests. Dis. Agric. For. USSR, Record Serv., 1932. Price 3 rub. [Recd. September 1934.]

The Locust Record Service of the Russian Union has three principal aims in view : to study the relation between fluctuations of the Acridid population and ecological conditions, in order to be able to forecast outbreaks ; to supply control organisations with data on the extent of infested areas and the best times for control measures ; and to collect statistics of losses caused by Acridids and of the cost of control. The necessary information is obtained through correspondents at general observation posts on insect pests, and at special locust observation posts.

This manual is intended for the use of observers at the observation posts. It contains a brief account of the structure, bionomics and ecology of Acridids, with keys to the adults, larvae and egg-pods of the commoner species. Detailed instructions are given for making observations on the species occurring in an area ; their ecological distribution, abundance, preferred habitats, phenology, and migrations ; limiting factors ; the losses caused in pastures and to cultivated plants ; the effects of control measures ; and climate and microclimate.

[BEĬ-BIENKO (G. Ya.).] **Бей-Биенко (Г. Я.). The Control of noxious Acrididae.** [In Russian.]—Demy 8vo, 97 pp., 33 figs., 24 refs. Moscow, OGIZ, 1934. Price 1 rub. 10 kop.

A concise account is given of the bionomics and ecology of Acridids, the organisation of campaigns against them and the usual methods of control, as well as of agricultural practices intended to reduce their breeding places. The more injurious species occurring in the Russian Union are briefly described.

[IVANOV (E.) & SPASSKIĬ (A.).] **Иванов (Е.) и Спасский (А.). Noxious Acrididae occurring in non-irrigated Lands in Central Asia and their Control.** [In Russian.]—Demy 8vo, 72 pp., 8 figs., 3 refs. Moscow, SAOGIZ, 1934. Price 1 rub. 65 kop.

Natural conditions in the vast non-irrigated areas of Russian Central Asia, which are only partly cultivated, are favourable to the permanent occurrence of a number of Acridids, including *Dociostaurus maroccanus*, Thnb., *D. kraussi*, Ing., *D. plotnikovi*, Uv., *Ramburiella turcomana*, F. W., and *Calliptamus* spp. Numerous data on the ecology of each species are given. Poisoned baits are considered most suitable for the control of all except *R. turcomana*, which does not eat them and should be dealt with by spraying. The technique of preparing and using baits is described in great detail.

MILLER (N. C. E.). **Control of Insect Pests in stored *Derris*.**—*Malay. agric. J.* **22** no. 8 pp. 367–368. Kuala Lumpur, August 1934.

In addition to beetles already mentioned [*R.A.E.*, A **19** 647 ; **21** 677], the Bostrychids, *Sinoxylon rugicauda*, Lesne, and *Xylothrips flavipes*, Ill., the Cerambycid, *Perissus laetus*, Lameere, the Lamiid, *Pterolophia melanura*, Pasc., and the Tenebrionid, *Alphitobius laevigatus*, F., cause damage to stored *Derris* roots in Malaya. The females

oviposit in cracks and irregularities on the outside of the roots, and the larvae bore into the tissues and reduce them to powder. The period from egg to adult lasts about nine weeks, and the adult remains in the root for a short time before boring its way out. The presence of frass from the boring of adults usually indicates extensive damage. Store-houses should have well fitting doors and window gauze of 1 mm. mesh, and should be kept free from pieces of root left over from previous consignments. If only roots not more than  $\frac{1}{2}$  inch in diameter are transported, the danger of infestation is minimised. If the dried roots are powdered and packed in sealed tins, or cut into 2-inch lengths and packed in ply-wood chests (such as those used for tea), infestation is prevented. When the damage is not advanced, the larvae, pupae and adults may be killed by exposing the roots for about 5 hours to bright sunlight, results being more rapid if the roots can be spread on iron sheeting or on a cement floor. In cloudy weather, carbon bisulphide (2-3 lb. per 1,000 cu. ft. for 72 hours) may be applied on the top of the pile of roots, preferably being sprayed on to cloth or sacking. Exposure to heat for 3 days without scorching also destroys the borers, the smoke-house on a rubber plantation being suitable for this treatment.

SCHWENCKE (E. H.). **Ein neuer Sisalschaden in Ostafrika.** [A new Injury to Sisal in East Africa.]—*Tropenpflanzer* **37** no. 8 pp. 322-325. Berlin, August 1934.

In Tanganyika, *Scyphophorus acupunctatus*, Gyll., was originally recorded as ovipositing in the hearts of sisal plants, in which the resulting larvae fed so that the leaves, when unfolded, seemed as if riddled by bullets. In 1931, a new form of injury was caused by this weevil in the Pangani district. Innumerable fine holes, as if made with a needle, occurred in the outer heart leaves on the outer surface of the leaf-edge about 2 inches from the base. The injury often becomes noticeable only after 1 or 2 years, when the large percentage of discoloured fibres attracts attention.

Investigation in 1933 showed that the living plants are attacked only for feeding, oviposition being confined to dead tissues such as those of cut stems split open to facilitate drying before burning [*R.A.E.*, A **21** 444]. In the past, when the weevil oviposited in the heart of living plants, such stems had failed as traps, but they have now proved highly attractive.

TAYLOR (F.). **Beekeeping for the Beginner. XV. Diseases and Enemies of Bees.**—*Fmg in S. Afr.* 1933, reprint no. 2, pp. 71-78, 8 figs. Pretoria, June 1934.

The most serious enemies of bees in South Africa are Sphegids, the commonest species being *Palarus latifrons*, Kohl, and *Philanthus diadema*, F., which capture them near the hives and in the fields, respectively. As many as three bees are paralysed by a female Sphegid and placed in the underground brood cell, where they eventually serve as food for the larva that hatches from an egg deposited on one of them. These predators may be effectively controlled by placing in front of the hives shallow vessels containing water with a thin film of paraffin, into which they readily dive. As the bees rarely leave the hives between 8 a.m. and 4 p.m. where Sphegids are prevalent, the danger of catching them also may be reduced by removing the traps before 4 p.m. Other

measures used include catching the wasps on twigs covered with an adhesive and hung over the hives (though bees will also be caught); killing them with fly-swatters; and keeping the hives under trees, as the wasps are only active in places exposed to the sun.

Other important pests are the wax moths, *Galleria mellonella*, L., causing much more damage than *Achroia grisella*, F. Notes are given on their bionomics [cf. *R.A.E.*, A **18** 485, etc.], and for control it is recommended to keep the colonies of bees strong (as the moths only attack weak colonies); to use modern hives with movable frames [cf. **21** 45]; and to fumigate the infested combs with carbon bisulphide (at least 1 fl. oz. per cu. ft.).

Ants sometimes become very troublesome, but can be prevented from infesting the hives by placing on the stands cloths soaked in a saturated alcoholic solution of mercury bichloride so that they overlap about an inch all round; such cloths will remain effective for a year or even longer. Other measures of value are: using barriers of wagon grease or motor oil; removing all vegetation round the hives and covering the ground with a thin layer of coal ash to prevent the growth of weeds; and destroying ant colonies.

The Tachinid, *Rondanioestrus apivorus*, Villen. [cf. **18** 673] is not a serious pest, and as it is sluggish, it can be killed by means of a fly-swatter. The bee louse, *Braula coeca*, Nitz. [cf. **20** 121], though commonly found in hives, is not considered responsible for any damage in South Africa; bee-keepers can do nothing to control it [but cf. **21** 64]. The Sphingid, *Acherontia atropos*, L., the adults of which sometimes enter hives, probably to reach the honey, is not considered a pest, and may be excluded by making the entrances small.

PETTEY (F. W.). *Cactoblastis cactorum*. **Government's Policy with Regard to Distribution of the Insect.**—*Fmg in S. Afr.* 1934 reprint no. 37, 5 pp., 4 figs. Pretoria, April–May 1934.

In view of the effectiveness of *Cactoblastis cactorum*, Berg, against prickly-pear (*Opuntia*) in Australia [cf. *R.A.E.*, A **21** 276, etc.], the advisability of establishing it in South Africa has been further considered [cf. **19** 192]. Attempts during 1933 to feed the larvae on a large number of different economic plants all gave negative results. In Australia, they have been known very rarely to cause slight injury to a few tomatoes and a kind of cucurbit growing near an area of eradicated prickly-pear, but they have never infested fruit of any kind even in orchards or vineyards surrounded by stretches of the cactus. Injury to the valuable spineless species of *Opuntia* in South Africa may be prevented by collecting and destroying the egg-sticks of the Pyralid [cf. **18** 288], which hatch in 5–6 weeks, 2–3 times during October–November and January–February. Any isolated infested joints should be removed and destroyed. Plants having an open habit of growth such as *O. fuscicaulis* should be grown, and the rows should be widely spaced. Weeds, tall grass and bush must not be allowed to grow up amongst the crop. Cattle should not be allowed to graze in the plantations, as the plants then become denser so that the egg-sticks are not so readily seen, but the flattened stems should be harvested. *Cactoblastis* completely destroys the aerial parts of jointed cactus [*O. aurantiaca*], and leaves the underground parts, which, however, are rendered more accessible to poison. An outline of the method to be adopted in the distribution of the eggs in Cape Province is given. At the

beginning of November 1933 a breeding station was established, and 450,000 eggs were obtained by March 1934; 100,000 of these were retained for cage breeding and the surplus divided into three colonies and liberated in the veldt.

MALLY (C. W.). **Raw Linseed Oil and Seal Oil for controlling Irregular Blossoming and Foliation in Fruit Trees.**—*Bull. Dep. Agric. S. Afr.* no. 125, 23 pp., 12 figs., 2 refs. Pretoria, 1934. Price 3*d*.

The length of the period over which apples and pears may blossom and set fruit in South Africa renders difficult the timing of sprays of lead arsenate against the codling moth [*Cydia pomonella*, L.]. The delayed appearance of some of the leaves and blossoms was effectually prevented by the annual application of 3–5 per cent. emulsions of raw linseed or seal oil about a month before the normal time of blossoming, so that fully 90 per cent. of the fruit was ready for the calyx spray at the same time. The same trees have been treated for five successive years without ill effects. Maize oil was slightly inferior. A convenient formula for the stock-emulsion is: linseed or seal oil, 1 gal.; soap, 6 oz.; water, 3 pints; caustic soda, 1 oz.

These oils also appear to assist in the control of various insects and mites. They bring pear buds to a condition in which they are able to resist the attacks of *Eriophyes* sp., and appear to obviate the use of other treatments, particularly if the mite is checked during the summer by a contact insecticide applied against the eggs of *C. pomonella*. It appears that raw linseed oil acts as a contact insecticide for *Eriosoma lanigerum*, Hsm., on apple and the resulting film prevents infestation. It does not produce a very rapid mortality of *Aonidiella* (*Chrysomphalus*) *aurantii*, Mask., on pear, but numbers of the scales die under the oil film. Applied at 5 per cent. strength in September, it gave 60–70 per cent. mortality in one month, and after an application in the following September the tree was practically free from infestation in the summer. Less favourable results, however, were obtained on other trees. Slight infestations could probably be controlled. Seal oil gave nearly complete mortality of all the scales covered on pear trees in the spring of 1932. Eggs of *Bryobia* [*praetiosa*, Koch] gradually perish under the film of either oil, a 5 per cent. spray giving about 60 per cent. mortality, but it would probably be necessary to resort to the usual lime-sulphur treatment if a rapid increase occurred.

SMIT (B.). **The Protection of Hides and Skins from the Ravages of the Skin Beetle, *Dermestes vulpinus*.**—*Sci. Bull. Dep. Agric. S. Afr.* no. 129, 17 pp., 5 pls., 2 figs., 4 refs. Pretoria, 1934. Price 3*d*.

On the South African veldt, *Dermestes vulpinus*, F., acts as a scavenger, cleaning the bones and devouring the hard, dry skin of carcasses. Frequently, however, it attacks stored ox hides and sheep skins [cf. *R.A.E.*, A 19 645], in which it develops rapidly in hot weather, so that many are useless on their arrival at the coast and others are reduced in value. Injury is associated with improper flaying and preparation, and it is considered that most of the damage could be avoided by the adoption of suitable precautions. The eggs are laid in batches of 3–20 in a crack or crevice in the skin and hatch in 3–12 days. The larval period lasts about 5 weeks in summer, but required 238 days from April to the end of November. The larvae feed more voraciously than the

adults. The latter emerged after a pupal period of 15 days in December. They are sluggish in winter and may survive until spring in sheltered places. Injury to the outside of the hide destroys the grain and causes the hair to fall off, and attack on the inside weakens the leather and may ruin it by the construction of tunnels. Untreated sun-dried hides were ruined by this Dermestid in 35 days during January–February.

Experiments were undertaken on the preservative properties of salt and arsenic and the effectiveness of various methods of application on ox hides. The treated hides were stacked in the middle of a store-room (their position in the heap being changed at regular intervals). They were twice artificially infested with larvae and adults in January, and were carefully examined throughout the summer. Hides that were rubbed with salt and soaked in brine remained unattacked. Those that had been treated with salt on the fleshy side only were damaged in the folds, especially round the edges, and patches of the grain and hair were removed. A spray of  $2\frac{1}{2}$  per cent. sodium arsenite gave better protection to sun-dried skins than one of 2 oz. bitter Cape aloes, 5 oz. sodium arsenite and 5 oz. washing soda in 4 gals., a mixture commonly applied to the skins just before export. Spraying on the fleshy side did not prevent damage to the grain of the leather, though it afforded considerable protection. The water in the sprays added to the weight of the dried skins, but it evaporated in under 12 days at the coast. Dipping the skins straight from the animal in a  $2\frac{1}{2}$  per cent. solution of sodium arsenite proved more effective than spraying and gave almost entire protection, besides avoiding the addition of any appreciable weight. If weaker solutions are used, salting will also be necessary against decay, and a stronger solution will be required to prevent it if the skins are dried in the shade in damp weather. The arsenic did not appear to affect the leather at any stage of its manufacture.

COTTERELL (G. S.). **Infestation of stored Cocoa by Weevil (*Araecerus fasciculatus*) and Moth (*Ephestia cautella*).**—*Bull. Dep. Agric. Gold Coast* no. 28, 14 pp., 2 pls. Accra, 1934. Price 3d.

Cacao beans damaged by *Araecerus fasciculatus*, DeG., and *Ephestia cautella*, Wlk., which are about equally prevalent, constitute a serious defect in prepared cacao exported from the Gold Coast. The Anthribid also attacks decayed pods and broken husks of growing cacao, withered coffee berries, decayed bolls and seeds of cotton, diseased bananas and the pods of leguminous plants, and may infest stored cereals and other products, provided that they contain sufficient moisture. The female lays an average of 5–6 eggs in the cacao beans 2 days after emergence. The larvae hatch in 3–9 days and feed on the cotyledons for an average of 65. The pupal period lasts 6 days. Only one larva occurs in each bean, and during its development it eats out about a third of the interior. The injury to the testa caused by the adult in feeding and oviposition is negligible by itself but prepares the way for subsequent infestation by *Ephestia*. The beetles are not attracted to fermenting beans. Those having a moisture content of 10–30 per cent. are most favourable for oviposition and subsequent development; those containing under 8 per cent. moisture are sometimes infested, but larval life is greatly prolonged. Infestation may be prevented in the field by collecting and burying all decayed pods and old husks, and on the drying trays by proper fermenting and rapid and thorough drying.

Eggs within infested beans are destroyed by exposure to strong sunshine at a minimum temperature of 132°F. for 2 hours, 129°F. for 3 or 125°F. for 4; such temperatures occur frequently in typical cacao centres, particularly when the main crop is being harvested during September–November. Store-rooms must be dry enough to prevent the beans taking up moisture and should be well ventilated. Débris, in which the Anthribid breeds freely, should be swept from under the wooden trestles that raise the bags from the floor, which is usually the dampest part of the store.

Infestation by *E. cautella* [cf. *R.A.E.*, A **21** 12], particularly at the end of the season when the beans have been in storage for 3–4 months, has increased during the last 2 years, principally owing to the lengthening of the period between harvesting and shipment and to lack of storage accommodation. One female lays an average of 250 eggs indiscriminately in the stores, principally during the first 4 days after emergence. The larvae hatch in 4 days and enter broken beans, in which they feed for an average of 49. They pupate on the exterior of the bags, most frequently in the seams or at the point of contact of two bags, and the moths emerge after an average of 12 days. The life-cycle lasts about 2 months, and 5–6 generations occur annually. The larvae also feed on cacao dust and débris and on stored cereals, ground-nuts and coffee. Preventive measures [18 427] include storing only clean and unbroken beans in new bags or bags that have been fumigated, the provision of as much light and ventilation as possible, and the removal of the bags in the order in which they were placed in the store, thus avoiding unnecessarily lengthy storage. An ideal type of store is briefly described. In infested stores, the moths may be trapped by pans of cold tea (containing sugar and milk) [cf. 17 268], diluted palm wine or urine, particularly if they are placed under an artificial light. The seams of the sacks should be searched on the first appearance of the moths and the cocoons destroyed. Most stores in the Gold Coast cannot be effectively sealed, so that fumigants will not penetrate sufficiently into the bags to kill all stages of the Pyralid [cf. 22 3]. As, however, owing to the seasonal nature of the crop, the generations do not overlap to any extent and the moths are numerous for only a few weeks, fumigation as soon as they begin to appear will kill them as well as the larvae that are about to spin their cocoons and the pupae. For generating hydrocyanic acid gas, 1½ oz. sulphuric acid and 4½ oz. water should be placed in an earthenware pot, and 1 oz. sodium or potassium cyanide added after the room is sealed; 6 pots are required per 1,000 cu. ft. space. Carbon bisulphide (5 lb.) may also be used, the liquid being placed in shallow receptacles (each holding not more than 1 lb.) above the material to be fumigated. Rooms should be opened after 24 hours' exposure to the fumigant.

GOLDING (F. D.). **On the Ecology of Acrididae near Lake Chad.**—*Bull. ent. Res.* **25** pt. 2 pp. 263–303, 3 maps, 2 graphs, 12 refs. London, July 1934.

As the Nigerian shore of Lake Chad was suspected of being an area from which outbreaks of *Locusta migratoria migratorioides*, R. & F., and *Nomadacris septemfasciata*, Serv., originate, a preliminary survey was made in 1931, and in 1933 ecological research on these two species and about 60 other Acridids was carried out at Kalkala, at the south-west corner of the Lake. The agricultural and climatic conditions in the

Kalkala area, as well as the vegetation, soils, fauna and microclimate of the habitats frequented by Acridids are described, and some observations on the hydrography of Lake Chad are included. Notes are given on the bionomics and ecology of most of the Acridids observed. The occurrence of *Anacridium moestum*, Serv., was found to depend on that of small trees of *Acacia* and *Zizyphus*.

*Nomadacris*, which was studied biometrically and found to represent *ph. transiens* (*congregans*), frequented tall grass from November to the end of April, after which the adults gradually moved to short grass and agricultural land. They began to breed in June. The imaginal diapause lasted from early October to late July. There is no evidence that any swarms had migrated from the Chad area, and it appears that conditions there are unsuitable for the production of *ph. gregaria*. The *solitaria* phase of *Locusta* bred from late January to June, but the numbers decreased steadily, chiefly owing to the attacks of a bee-eater and to bush fires. The principal habitats of this locust were *Cynodon dactylon*, *Brachiaria ramosa* and *Chloris gayana*. Its scarcity indicated that the area is unlikely to be an outbreak centre, but further research is necessary to confirm this.

Ghesquière (J.). **Un Calliceratide (Hym. Proct.) nouveau du Congo belge.**—*Ann. Soc. zool. Belg.* **65** pp. 59–62, 5 figs., 4 refs. Brussels, 1934.

A description is given of the female of *Allomicrops bemisiae*, sp. n. (the male being unknown), which was obtained in the course of rearing *Bemisia gossypiperda* var. *mosaicivectura*, Ghesq. [*R.A.E.*, A **22** 251], a pest of cassava in the Belgian Congo. It is not known whether it is a parasite or hyperparasite of the Aleurodid, as various Diptera emerged at the same time.

Jepson [W. J.]. **Conférence sur le *Phytalus smithi* faite à la chambre d'agriculture.**—*Rev. agric. Ile Maurice* no. 75 pp. 79–84. Port Louis, 1934.

In connection with work being done by the Parasite Laboratory of the Imperial Institute of Entomology with a view to the control of *Lachnosterna* (*Phytalus*) *smithi*, Arrow, in Mauritius, the author carried out an investigation in the United States to study the organisation of measures against *Popillia japonica*, Newm., and in Porto Rico to determine the factors that have contributed to the reduction of injury to sugar-cane by species of *Lachnosterna*. An attempt to obtain natural enemies of Lamellicorns in Porto Rico for shipment to Mauritius is described. Up to 1928, Lamellicorn larvae were so numerous and widely distributed that the cultivation of ratoon cane was impracticable over a large area in the south of the former Island. Regular hand-collection of the adults and destruction of the larvae produced only a localised effect. A study of the Hymenopterous parasites in 1924–25 [*R.A.E.*, A **15** 409] indicated that the 3 or 4 native Scoliids were negligible factors in control, possibly owing to lack of systematic propagation of a plant on which the adults of these parasites are believed to feed. The factors that have brought about the present status of control of Lamellicorns in the Island appear to be the introduction of resistant varieties of cane, the development of irrigation, which has raised the yield of plant cane, improved cultural methods, and the introduction of *Bufo marinus* [**15**

153; 21 235]. This toad can swallow 12–15 large Lamellicorn beetles (the equivalent of 17–20 of *L. smithi*) in a night, these constituting 50 per cent. of its total nourishment.

Very few of the numerous insect enemies of white grubs collected survived the 9 weeks voyage to Mauritius. Over 300 larvae of a Coleopterous enemy reached Mauritius alive, and most of these were liberated. Only 18 of one species out of 750 females of four different Scoliids survived, and of these 11 were liberated. Not one adult of the most widely distributed species arrived alive, but 75 cocoons produced females after arrival. As no males were available, however, the eggs laid by these produced males only and the species died out. None of a consignment of 1,500 individuals of *Scolia manilae*, Ashm., which was obtained from Hawaii arrived alive. It was decided to destroy the 50 examples of *Bufo marinus* brought from Porto Rico pending further study of a toad already present in Mauritius.

The status of *L. smithi* in Mauritius is discussed. Although not a serious menace to the sugar industry as a whole, it causes considerable damage in some plantations. The effectiveness of hand-collection diminishes with the increasing area of infestation, and the position of centres of attack is such that the entire range of sugar cultivation will soon be affected. Unless new factors develop, it will be 20–30 years before the biological equilibrium is restored as it has been in Porto Rico and elsewhere. Although *Tiphia parallela*, Smith, and *Campsomeris (Elis) thoracica*, F., the two parasites already established, have a beneficial effect in some localities owing to the systematic cultivation of *Cordia interrupta*, they do not make themselves felt until the white grubs have already reached maximum numbers. They do, however, prevent the grubs from re-establishing themselves. Suggested control measures, based on observations in the West Indies and in Mauritius itself, include careful cultivation, the use of resistant varieties of cane, and extra liberations of *T. parallela* and *C. thoracica* in years when they are less numerous, aided by importation of additional species of parasites. Of three species of *Campsomeris (Elis)* discovered in Madagascar and Rodrigues, two have been introduced into Mauritius and liberated in several localities [21 424, 464] and one has recently been recovered. Investigations of the stomach contents of the local toad showed that all examples from infested regions had fed on *L. smithi*, and it is recommended that a further consignment of *Bufo marinus* should be introduced, as toads appear to be an important factor in keeping down the numbers of white grubs in Mauritius. The cultivation and distribution of a fungus known to attack *L. smithi*, particularly under humid conditions, is also recommended.

**Work connected with Insect and Fungus Pests and their Control.**—*Rep. agric. Dep. St Kitts-Nevis 1933* pp. 2–3, 38–39. [Trinidad] 1934.

In 1933, *Lixophaga diatraeae*, Tns., which was liberated in St. Kitts against *Diatraea saccharalis*, F., on sugar-cane in 1932 [*R.A.E.*, A 21 647], appeared to have become established throughout the Island. *Metamasius hemipterus*, L., also occurred on sugar-cane on several estates. *Citrus* leaves were considerably injured by grasshoppers in St. Kitts, and rather ineffectual attempts were made to control them with poison baits and lead arsenate sprays. The sugar-cane root-borer, *Diaprepes (Exophthalmus) esuriens*, Gyll., also damaged the leaves and roots of *Citrus*. *Platyedra (Pectinophora) gossypiella*, Saund. [*cf. loc.*

*cit.*] severely infested late planted cotton. The planting of the whole crop should be completed in as short a period as possible. In Nevis, the cotton stainer [*Dysdercus*] occurred throughout the picking season, especially in the southern part of the Island.

**Insect Pests and their Control.**—*Agric. Gaz. N.S.W.* **45** pt. 7 pp. 383-387, 7 figs. Sydney, 1st July 1934.

Further notes are given on injurious insects in New South Wales [*cf. R.A.E., A* **22** 547], including some information already noticed [**16** 164; **18** 195]. The measures recommended against the ants, *Iridomyrmex detectus*, F. Sm., which often nests on tennis courts, *I. rufoniger*, Lowne, and *Camponotus nigriceps*, F. Sm., which attack foodstuffs in houses, and *Myrmecia* spp., which prove troublesome near dwellings, are a bait already noticed [**21** 278] and one of 1 lb. sugar,  $\frac{1}{4}$  oz. borax and 1 pint water to which is added  $\frac{1}{16}$  oz. sodium arsenite (80 per cent. arsenious oxide) in 2 fl. oz. water and finally 1 oz. honey, and fumigation of the nests with 1-2 oz. carbon bisulphide, 1 pint of a solution of 4 oz. potassium cyanide in 1 gal. water, or calcium cyanide dust.

*Eriophyes vitis*, Land., is seldom a serious pest of grape vines, though it causes discoloration of the young leaves by feeding on the lower surface. It breeds throughout the spring, summer and autumn and overwinters beneath the bud scales [*cf.* **16** 442]. A spray of lime-sulphur (1 : 10) may be used in late winter and one of 1 lb. atomic sulphur in 16 gals. water or a dust of sublimed sulphur when the vines are in leaf. T. McCarthy found in 1933 that *Phyllocoptes* sp. and *Tenuipalpus* sp. are partly responsible for abnormal conditions of the foliage and fruit of vines that have for many years been attributed to weather, etc. *Phyllocoptes* destroyed the epidermal cells on the upper surface of the leaves, causing discoloration, and *Tenuipalpus* was always associated with a brownish incrustation on the fruits and fruit stalks. The eggs of the former are laid on the upper surface of the leaves, and those of the latter on the lower surface and on the stalks. Both species overwinter under the loose bark and are widely distributed. One season's work indicates that they may be controlled by lime-sulphur (1 : 10) applied in the winter before the buds begin to swell. Control might be obtained during the growing period by applications of lime-sulphur (1 : 70), commencing when the new growth is 6-9 ins. long and the mites are exposed on the foliage, though spraying or dusting with colloidal, sublimated or atomic sulphurs would probably be more satisfactory. Grape vines are also attacked by *Lecanium persicae*, F., which is sometimes found on stone fruit trees, particularly plum and prune. It usually infests the older canes, though the immature stages may be present on the lower surface of the leaves late in the season. Large numbers of eggs are laid late in summer. This Coccid, which is common but seldom injurious, may be controlled by a 2.5 per cent. spray of miscible oil applied when the vines are dormant.

PESCOTT (R. T. M.). **The Codling Moth** (*Carpocapsa pomonella* L.).—*J. Dep. Agric. Vict.* **32** pt. 7 pp. 347-352, 6 figs. Melbourne, July 1934.

An account is given of the bionomics and control of *Cydia* (*Carpocapsa*) *pomonella*, L., in Victoria, where it has two generations and a partial third annually [*cf. R.A.E., A* **15** 623; **22** 22].

COGHLAN (G. E.) & PEScott (R. T. M.). **Grass Thrips attacking Tobacco Plants** (*Anaphothrips obscurus* Müll.).—*J. Dep. Agric. Vict.* **32** pt. 7 pp. 357–359, 5 figs. Melbourne, July 1934.

In Victoria, *Anaphothrips obscurus*, Müll., often occurs on tobacco in the seed-beds, where it weakens the seedlings, or in large numbers on the lower leaves in the field, where it causes little actual damage. It had not proved important economically until April 1934, when it was numerous on the lower surface of the leaves in one district, causing slight wilting and the appearance of "silvery frosted" areas and in severe infestations the withering of the lower half of the leaves, which renders them valueless. Even lightly infested leaves were difficult to cure owing to the depletion of sap and moisture, and the affected parts of those attacked just before harvest became discoloured when heated. The cured leaf is thus disfigured and its value reduced. The thrips, which were particularly injurious to well grown crops planted in late December, were comparatively inactive during the dry weather of February and March, but increased considerably with the advent of rain in April and the ripening of the crop. Damage is caused by both the larvae and adults, which are briefly described. The seedlings may be sprayed with 1 oz. nicotine sulphate in 5 gals. soapy water or 1 lb. kerosene emulsion to 5 gals. water, applied particularly to the lower surface of the leaves. Little can be done on growing crops, but when they are infested late in the season, early harvesting may minimise the damage. Burning or ploughing-in waste plants, etc., after the tobacco has been cut will destroy the hibernating thrips and their eggs.

MCDougall (W. A.). **The Determination of Larval Instars and Stadia of some Wireworms (Elateridae)**.—*Qd agric. J.* **42** pt. 1 pp. 43–70, 3 pls., 2 figs., 18 refs. Brisbane, 1st July 1934.

Work carried out with *Lacon variabilis*, Cand., the most injurious of the wireworms attacking sugar-cane in central Queensland [*cf. R.A.E.*, **A 22** 169], showed that the larval instars are more easily determined by the greatest width of the ventral mouth-parts than by the length of the larvae, ratios of the antennal segments or width of the head capsule as in Dyar's Law [*cf. 20* 579]. By this measurement, a random larval population can be divided into well-defined groups, of which each represents an instar. The average figures obtained for groups representing the last 7 instars, or the individual ones obtained for a single larva in each of these instars, increase in approximately arithmetical progression. *L. variabilis* normally undergoes 8 larval instars, but a few individuals may pupate after 6. These findings are equally applicable to 9 other species of *Lacon* and 7 of *Heteroderes*. Before ecdysis, the larvae become torpid and undergo changes in shape and colour and sometimes an increase in measurable length, and their characteristic appearance, together with an increased appetite after ecdysis, was of practical value in the collection of data for the smaller larvae. The larvae of *L. variabilis* may be divided into three classes: those that hatch from eggs deposited during November–February and pupate during the following October–January; those that hatch from eggs laid during November–January and pupate during March–April; and those that hatch from eggs laid by adults of the latter group and pupate during the following November–January.

The technique used in rearing is described. The critical periods were the early instars, in which *L. variabilis* required excessive soil moisture

and *H. carinatus*, Blkb., only moderate moisture under the same conditions. These two species are the commonest in the cultivated cane fields in the central Queensland mill areas.

NEWMAN (L. J.). **Entomological Problems. The Introduction, Increase and Control of various Insect Pests.**—*J. Dep. Agric. W. Aust.* (2) **11** no. 2 pp. 201–206. Perth, W.A., June 1934.

Brief notes are given on some of the more injurious insects and mites in Western Australia, many of which have been introduced together with their food-plants since 1890, and on the development of measures for their control.

GARDNER (J. C. M.). **Immature Stages of Indian Coleoptera (15) (Scolytidae).**—*Indian For. Rec.* **20** pt. 8, 17 pp., 2 pls., 4 refs. Delhi, 15th August 1934. Price 10d.

The larvae of several Scolytids, including *Xyleborus fornicatus*, Eichh., from *Ricinus communis* and *X. eugeniae*, Eggers, from *Eugenia jambolana*, are described, and keys are given to the larvae of the genera dealt with and of species of *Dryocoetes* and *Xyleborus*.

RIBEIRO (S.). **Some Insects found associated with the Bitter-gourd, *Momordica charantia* Linn. (Cucurbitaceae), in Calcutta.**—*J. Asiat. Soc. Beng.* (N.S.) **29** (1933) no. 1 pp. 89–93, 13 refs. Calcutta, August 1934.

A list is given of 12 species of insects collected in April–June 1933 from bitter gourd (*Momordica charantia*) in Calcutta. They include *Epilachna vigintioctopunctata* var. *sparsa*, Hbst. (*pubescens*, Hope), which feeds on the flower-buds and on the epidermis of the leaves, *Rhaphidopalpa* (*Aulacophora*) *abdominalis*, F., *Ceratia* (A.) *atripennis*, F., and *Eutettix phycilis*, Dist., which attack the leaves, and *Dacus* (*Chaetodacus*) *cucurbitae*, Coq., which infests the fruit.

HUTSON (J. C.) & DE ALWIS (E.). **The Tobacco Stem-borer (*Phthorimaea heliopa* Lw.).**—*Trop. Agriculturist* **83** no. 1 pp. 64–66, 1 pl. Peradeniya, July 1934.

*Phthorimaea heliopa*, Lw. [cf. *R.A.E.*, A **18** 159, etc.], is probably the most important insect pest of tobacco in Ceylon. All stages are described. The adults are nocturnal, and the females oviposit for 1–2 weeks, beginning about 3–8 days after emergence. In captivity, they laid 50–150 eggs each, most of them during two nights. Probably more eggs are laid in the field. The larvae hatched after 4–6 days and fed for 24–30 or slightly more. The pupal chamber is constructed in the tobacco stem, only a circular patch of epidermis being left to close it from the exterior. The pupal period occupied about 10–11 days. The whole life-cycle lasted  $5\frac{1}{2}$ – $7\frac{1}{2}$  weeks in the insectary, but may be shorter in the field. The use of cloth screens that can be closed at night [cf. **21** 64] has definitely reduced infestation in nurseries. The possibility of using poison-bait and spraying seedlings is considered. The use of vigorous seedlings, the elimination and burning of infested ones, transplanting into suitable soil, the periodical replacement of infested plants by vigorous stock, cutting back older attacked plants to the collar level so as to obtain one good shoot, slitting swollen stems

with a knife and destroying the larvae and pupae inside, and crop rotation are among the measures suggested. Only one crop of tobacco should be grown in a year.

FRAPPA (C.). *Les insectes nuisibles au caféier à Madagascar*.—*Bull. écon. Madagascar* (N.S.) no. 82 pp. 73–79, 10 refs.; no. 83 pp. 66–71; no. 88 pp. 296–305, 4 refs.; no. 89 pp. 370–379, 31 refs. Tananarive, September & October 1933, March & April 1934. [Recd. September 1934.]

This paper brings together the results of investigations since 1928 on pests of coffee in Madagascar. The relation of the Coccid, *Lachnodioides greeni*, Vayss. [cf. *R.A.E.*, A 18 508] to an unidentified polyporaceous fungus [cf. 22 227] is discussed in detail; their association, chiefly on the roots of *Coffea robusta* in low lying and damp areas, causes serious injury. *Brachytrypes membranaceus* var. *colosseatus*, Sauss. [19 372] may be controlled by poison-baits of maize flour, sugar and arsenic (1–2 per cent.), by trap-pits containing 2 per cent. kerosene in soapy water, and by scattering paradichlorobenzene in the underground galleries. In addition to the Scolytids already noticed [17 193; 21 494], the Bostrychids, *Apate femoralis* var. *lignicolor*, Fairm., and *A. monacha*, F., have been found in small numbers infesting the trunks and branches.

The species of *Chilocorus* often observed as a predator on coffee bushes infested with *Pseudococcus filamentosus*, Kkll. [20 271] has now been identified as *C. haematocephalus*, Sic. *Coccus* (*Lecanium*) *viridis*, Green [18 508] appears to be confined to the eastern parts of the Island, most of the damage being usually caused to coffee bushes less than 5 years of age. The injury becomes particularly noticeable during the rainless period in October and November, when the trees are weakened by the drought. Most of them recover in the rainy season. *C. (L.) africanus*, Newst., has been found on *Coffea arabica* at an altitude of over 4,000 ft., where the climate is rather cool, but it is not likely to become a serious pest under these conditions. Clean cultivation of the plantation, which should be neither too much nor too little shaded, would aid control.

*Leucoptera* (*Cemiosoma*) *coffeella*, Guér., has several generations a year. Weakened or diseased trees are usually attacked, and several larvae may occur in one leaf. After about 15 days, they pupate in cocoons on the lower surface of the leaves, the adults emerging in about 6 days. Infested leaves should be burnt and the adults caught by means of light-traps.

The form of *Antestia clymeneis*, Kirk., recorded from coffee [19 734] has been found to represent a new variety, here described as *galtiei*, var. n. *A. c.* var. *flaviventris*, n., is also described from another part of the Island. The local distribution of these Pentatomids is discussed. In a high plateau district, var. *galtiei* is found throughout the year, being especially abundant during the hot and moist season (October–November till March–April). The longest duration of the egg-stage observed was 24 days. The newly hatched nymphs usually live gregariously, puncturing the leaves, young twigs and berries of coffee. Most of the adults congregate on branches laden with fruit, usually from sunrise till about 8 a.m. and again from 4–5 p.m. till sunset. During the heat of the day they shelter in shady parts of the bushes. The author has never found *Antestia* on any other plant than coffee

and suggests that the rare individuals that have sometimes been observed on peach in Madagascar occurred there accidentally. In the field, the adults feed on green or red coffee berries, but in the laboratory they also fed on fresh leaves, chiefly puncturing the petiole or mid-rib. Usually, the injured berries turn black and drop. Infestation has been considerably checked by hand-collection. Measures adopted against *Antestia* spp. on coffee in Tanganyika, Kenya and Nyasaland are reviewed from the literature [21 302, etc.]. In Madagascar, a soap emulsion of ground-nut or castor oil gave excellent control of *A. clymeneis* var. *galtiei*, the bugs dropping to the ground in a state of coma 15–20 minutes after spraying; as the fallen bugs should be collected, it is important to keep the ground clear of weeds. The emulsion, which is also very effective against *Galeatus involutus*, Drake, a Tingid that occurs on coffee, is prepared by boiling 15 lb. common soap in 7–8 gals. water and adding 1 gal. of the oil after the solution has cooled, subsequently diluting to 100 gals. The best results, however, were obtained with an emulsion containing 2 gals. petrol extract of pyrethrum (the preparation of which is described), 15 lb. soap and 80 gals. water. The best time for spraying is the beginning of the rainy season, when the climatic conditions favour the development of the bugs. Two applications should be made in December at an interval of 15 days, and a third spray if necessary about the end of January. In 1932, *Telenomus* sp. sometimes parasitised about 70 per cent. of the eggs of *Antestia*.

Stored coffee beans are infested by the Anthribid, *Araecerus* (*Araecerus*) *fasciculatus*, DeG., against which fumigation with sulphur, etc., is recommended.

CURRAN (C. H.). **African Tachinidae—I.**—*Amer. Mus. Novit.* no. 751, 25 pp. New York, 13th October 1934.

The new species described include *Sturmia auratocauda*, recorded from Nigeria and the Gold Coast and reared from *Anomis* sp. and *Sylepta derogata*, F., on cotton, and *Linnaemyia agilis* reared from *Heliothis* (*Chloridea*) *obsoleta*, F., in Tanganyika and also found in South Africa.

HARRIS (W. V.). **Report of the Acting Entomologist, 1933.**—*Rep. Dep. Agric. Tanganyika 1933* pp. 69–75. Dar-es-Salaam, 1934.

Notes are given on the movements of locust swarms in Tanganyika in 1933. *Locusta migratoria migratorioides*, R. & F., oviposited in various localities in January and February; the resulting immature adults tended to fly north or north-west, thus leaving the Territory practically free by the end of June. In November, however, new swarms crossed the Uganda border and began to oviposit. At the end of the year *Nomadacris septemfasciata*, Serv. [*cf. R.A.E.*, A 21 671] was present and ovipositing throughout most of the southern half of the Territory.

Derelict sisal plantations were a source of infestation of coconut by *Oryctes*; *O. monoceros*, Ol., is the commonest species on coconut, *O. boas*, F., occurring more frequently on other palms. The weevil, *Rhina amplicollis*, Gerst., was found boring in coconut stems on Mafia Island. *Cerataphis lalaniae*, Boisd., infested the growing-point of coconut and ornamental palms and sometimes also the leaves, and

fruiting branches ; the large quantities of honey-dew produced encouraged the growth of sooty moulds, and the fruiting branches became withered. The larvae of the Prionid, *Mallodon (Stenodontes) downesi*, Hope, bored in coconut trunks.

The damage to locules of cotton in one district by *Platyedra gossypiella*, Saund., was only 7.9 per cent. as compared with 29.1 per cent. in 1932. At one experiment station, the larvae of *Prodenia litura*, F., migrated daily during April from a weed, *Boerhaavia diffusa*, to young cotton plants ; these were protected by calcium arsenate dust, and serious injury was averted by destruction of the weed. Severe damage was caused elsewhere when *Boerhaavia* was allowed to grow up among the cotton, but the latter was old enough to recover. *Bemisia* (?) *gossypiperda*, Misra & Lamba, was widely distributed on cotton, tobacco, cassava, and *Dolichos lablab*. Other cotton pests included millepedes, which attacked the newly planted seeds, satisfactory control being obtained by mixing the seeds with ashes before planting, *Liogryllus morio*, F., and unidentified Lamellicorn larvae.

Petrol is reported to have proved an effective fumigant for termite nests in Iringa. In experiments, however, up to 1 pint petrol sometimes failed to destroy nests of mound-building termites provisionally determined as *Termes (Odontotermes) badius*, Hav., on cultivated land ; 6 oz. carbon bisulphide has so far proved the cheapest and most efficient fumigant.

The Psyllid, *Trioza (Spanioza) erythrae*, Del G., was generally distributed on *Citrus*, but injury was rare among healthy plants. The Meloid, *Coryna apicicornis*, Guér., infested the flowers of ground-nuts [*Arachis hypogaea*]. Large numbers of the Galerucid, *Megalognatha suturalis*, Baly, appeared on the male spikes of maize in Mahenge, but there was no reduction in crop as the female inflorescences were unharmed. *Plutella maculipennis*, Curt., injured vegetables in the Uluguru Mountains. *Physothrips xanthocerus*, Hood, has increased in the Mbosi area since the coffee plants have commenced to fruit ; early spraying [cf. 21 106] proved effective. Control of larvae of the dusty ground beetle [? *Dasus simplex*, F.] has been obtained with a bait of coffee pulp and sodium arsenite.

GÖSSWALD (K.). Ueber die Frasstätigkeit von Forstschädlingen unter dem Einfluss von Altersunterschieden und der Einwirkung verschiedener Temperatur und Luftfeuchtigkeit und ihre praktische und physiologische Bedeutung. I. Untersuchungen an *Dendrolimus pini* L. [On the Feeding Activity of Forest Pests as influenced by Age, Temperature and Air Humidity, and its Practical and Physiological Importance. 1. Investigations on *D. pini*.]—*Z. angew. Ent.* 21 no. 2 pp. 183–207, 11 figs., 20 refs. Berlin, August 1934.

Counting the lumps of larval excreta of Lepidopterous forest pests generally indicates the extent to which a given instar is present, as they are easily classified by size, so that it is possible to ascertain the course of the infestation. Weighing the excreta does not allow for mortality in the younger instars, but merely shows the amount of injury.

In laboratory studies in Germany, the number of lumps produced daily by individual larvae of *Dendrolimus pini*, L., decreased regularly in successive instars. The numbers produced at various temperatures

are given. Excretion increased with a rise of temperature up to 28°C. [82.4°F.], above which it decreased. Neglect of the effect of temperature may lead to an error of 50 per cent. in an estimate of abundance. Relative humidity was less important, but entire disregard of it may entail 20 per cent. of error; the largest number of lumps was observed at the vital optimum of 75 per cent. [*cf. R.A.E., A 22 142*]. The methods of utilising data on excretion in calculating the abundance of the larvae are described in detail. At 28°C. and 75–90 per cent. relative humidity, the average daily weight of excreta produced by one larva ranged from 2.3 mg. in the first instar to 96 in the last (eighth). The average weights (in milligrammes) of 1,000 lumps of excreta produced by larvae in the successive instars were 9.21, 28.08, 56.25, 168.72, 714, 1,197, 2,257.5, and 2,880. The damage done in the first three instars before hibernation is slight. The effect of temperature and humidity on the absolute weight of excreta is so small that it may be ignored; the greatest weight was in the zone of the vital optima.

The relation between amount of excreta and amount of food ingested must be known if the amount of excreta is used for calculating the injury done. Points connected with the relation between nutrition and development of the larvae of *D. pini* are discussed on the basis of feeding activity (involving excretion).

KEMPER (H.). **Ueber die physiologische Wertbestimmung von Pyrethrumpulvern.** [On the Physiological Valuation of Pyrethrum Dusts.].—*Z. angew. Ent.* **21** no. 2 pp. 208–223, 1 fig., 3 pp. refs. Berlin, August 1934.

The various published methods for effecting physiological tests of pyrethrum dusts are briefly discussed, and three are described, of which the first two are in regular use by the Prussian authorities.

In the first, which is suitable for tests on adult Diptera, etc., the test chamber measures 48 inches in length by 28 in width and 64 in height. It has smooth sides (tiled or glazed), which must always be quite dry. The nozzle of a powerful bellows projects into the chamber at the centre of one of the narrow sides. Over this nozzle can be fitted a tube, the other end of which is bent so that it slants upwards. This slanting half is flattened and open so as to form a shovel. The dose of pyrethrum dust is placed on this shovel, over which a flat cover is then slid so that a flat mouthpiece results. After a sufficient number of test insects have been placed in the chamber, a strong blast of air blows in the powder and 5 further blasts disturb the air within. After 2 minutes, a sheet of paper is laid on the floor of the chamber so as to cover the powder that has settled, in order that insects that fall subsequently may not come into contact with this layer.

In the second method, which closely resembles one already noticed [*R.A.E., A 18 701*], a practically uniform layer of dust is spread on a sheet of glass. This is most suitable for insects that move almost exclusively on horizontal surfaces. If some of the insects are much more active than others, they are liable to come into contact with a greater amount of the dust unless all are removed to a sheet of clean paper after 2 minutes.

The third method is derived from the author's work with fish, etc. [*B 21 170; 22 60*]. A glass trough is filled with 5 litres of water at 15–18°C. [59–64.4°F.]. A dose of the dust is strewn on the surface,

and the water is stirred. One hour later, 5 sticklebacks are placed in the water. If they show no symptoms of poisoning after 24 hours, the test is stopped. Otherwise, it is continued until they die or recover.

DINGLER (M.). **Die Tierwelt des Spargelfeldes.** [The Fauna of the Asparagus Field.]—*Z. angew. Ent.* **21** no. 2 pp. 291–328, 6 figs., 19 refs. Berlin, August 1934.

The asparagus-growing areas in Hessen [cf. *R.A.E.*, A **22** 560] have a fauna of over 400 species, including 378 insects, most of which have no economic importance. A list is given of the insects, spiders and millepedes, and records from the world literature of other insects attacking cultivated or wild species of *Asparagus* and of their natural enemies are cited.

In Hessen, the only real pests were *Platyparea poeciloptera*, Schr., *Crioceris asparagi*, L., *C. duodecimpunctata*, L., and *Agromyza* (*Melanagromyza*) *simplex*, Lw., which last, however, was only once noted in abundance.

BÖRNER (C.) & SCHILDER (F. A.). **Die Verbreitung der Reblaus in Deutschland nach dem Stande des Jahres 1933.** [The Distribution of *Phylloxera* in Germany as shown by the Position in 1933.]—*NachrBl. dtsh. PflSchDienst* **14** no. 9 pp. 84–90. Berlin, September 1934.

In 1933, *Phylloxera* was found on grape vines in 25 new localities. There was a sudden increase during the year, especially in Baden. The destruction of infested vineyards was carried out regularly.

KLEMM (M.). **Erdraupenfrass an Mais.** [Injury to Maize by Cutworms.]—*NachrBl. dtsh. PflSchDienst* **14** no. 9 pp. 90–91, 4 figs. Berlin, September 1934.

During the summer of 1934, there was a widespread outbreak in Germany of *Euxoa segetum*, Schiff., on maize and other plants. Holes were eaten in some of the outer leaves while they were still rolled up.

VAN DEN BRUEL (W. E.). **L'infestation des serres par la teigne du pêcher *Anarsia lineatella* Zeller (Faun. spec. nov.).**—*Bull. Inst. agron. Sta. Rech. Gembloux* **3** no. 3 pp. 280–292, 12 figs., 16 refs. Gembloux, August 1934. (With Summaries in Dutch, German and English.)

In Belgium, *Anarsia lineatella*, Zell., was discovered in 1930 well established on peaches in greenhouses, and since then the infestation has spread rapidly, sometimes as much as 90 per cent. of the fruit having been rendered unsaleable. This Tineid was probably introduced with infested peaches from the Mediterranean region. The adult, larva and pupa are described. The bionomics are similar to those observed in other countries [*R.A.E.*, A **11** 284; **19** 381, etc.], but in Belgium the larvae apparently overwinter only in greenhouses. Injury in spring to the tips of young peach branches in the open resembling that caused by *A. lineatella* is really due to *Lygus* sp. The chief damage by the caterpillars is caused about a month after forcing begins, when the trees are in full bloom and the leaves about an inch long. Infestation may be prevented by careful inspection of nursery

stock, by not allowing packing material and boxes used for peaches to remain in greenhouses, by careful examination of such material for larvae or pupae, and by keeping all windows and doors in the greenhouses shut at night, or well screened, to prevent the moths from entering.

Fumigation with 95-98 per cent. nicotine at the rate of 1 fl. oz to 5,500 cu. ft. of space gave excellent results. Infested greenhouses should be fumigated shortly before the blossoming of the peaches, when the larvae are abundant and have not yet started to pupate, and again 3-4 days later. This measure is cheap and does not injure the trees. Methods of spraying peaches in other countries are briefly reviewed [11 80, 284; 13 156]. A spray of self-boiled lime-sulphur (2 lb. flowers of sulphur with 2 lb. quick-lime, containing at least 90 per cent. CaO, to 10 gals. water) with the addition of 3 lb. lead arsenate per 100 gals. was applied in the greenhouse during and just after the dormant period and at the beginning and end of blossoming without injury to the trees.

Characters distinguishing the adults and larvae of this Tineid and certain Tortricids that may attack peaches in various parts of the world are shown in a table.

BEWLEY (W. F.). **Tomatoes : Cultivation, Diseases and Pests.**—*Bull. Minist. Agric. Fish.* no. 77, v + 71 pp., 1 fig., 4 pls., 1 fldg. diagr. London, H.M.S.O., 1934. Price 1s. 6d.

This bulletin includes notes (pp. 53-62) on several Arthropod pests of tomato in glasshouses in the British Isles. An efficient spray against *Polia oleracea*, L., is 6 lb. lead arsenate, 2 oz. saponin and 100 gals. water [cf. *R.A.E.*, A 18 601]. All adults and 90 per cent. of the scale stages of *Trialeurodes vaporariorum*, Westw., may be destroyed by fumigating with sodium cyanide dropped into glass jars containing 33 per cent. sulphuric acid (at the rate of 1 oz. of the former to 4½ fl. oz. of the latter). The eggs are not killed, and a second application is necessary after from 14 days (in warm weather) to 21 days (in cold weather). The maximum dose that will not injure the plants is ¼ oz. to 1,000 cu. ft., and ⅓-¼ oz. is sufficient. Water must be withheld from the plants for 3 days before fumigation. Biological control with *Encarsia formosa*, Gah. [15 240, etc.] is satisfactory; if the infestation is severe, the plants may be fumigated without injuring the parasite with ⅓ oz. sodium cyanide in ½ fl. oz. of 33 per cent. sulphuric acid to 1,000 cu. ft. To avoid infection of tomato plants with spotted wilt [cf. 22 481], food-plants of *Thrips tabaci*, Lind., should not be allowed to grow near the greenhouses.

Crude naphthalene vaporised from lamps at the rate of 1 lb. to 1,000 cu. ft. or broadcast over the whole surface at 2 oz. per sq. yd. kills a high percentage of all stages of *Tetranychus telarius*, L., at not less than 70°F. Hibernating adults are not affected, so that fumigation should be carried out before the end of September. The woodlice, *Armadillidium vulgare*, Latr., and *Porcellio laevis*, Latr., which are minor pests, may be controlled by Paris green baits [21 487], by drenching the soil round the base of the walls, gutter pipes, etc., with boiling water, or by using pyrethrum dust or an emulsion of 1 gal. cresylic acid, 1 lb. naphthalene and 8 lb. soft soap in 98 gals. water as a contact insecticide. Soil infested by wireworms, including

*Agriotes lineatus*, L., *A. obscurus*, L., and *A. sputator*, L., can be cleared by steam sterilisation to a depth of 2 ft., unless the soil temperature is so low that they have burrowed deeper.

JACKSON (D. J.). **Notes on Parasites of *Abraxas grossulariata* in Fife.**—*Scott. Nat.* 1934 pp. 143–147, 5 refs. Edinburgh, 1934.

The following parasites were reared in Scotland from *Abraxas grossulariata*, L., collected, mainly in June, from gooseberry bushes severely damaged by this Geometrid: the Tachinid, *Phryxe nemea*, Mg., numerous larvae of which emerged, usually singly, from the late caterpillars 2–3 days after their death and passed a pupal period of 12–15 days in the soil; the Braconid, *Apanteles limbatus*, Marsh., which was also reared from the larvae; *Ichneumon* (*Stenichneumon*) *trilineatus*, Gmel., which was the commonest parasite of the pupae; *Pimpla examinator*, F., which was reared throughout the winter on the pupae of *Pieris napi*, L., *P. rapae*, L., and other Lepidoptera; and the Pteromalid, *Habrocytus moerens*, Wlk., which is a hyperparasite of the pupae, probably attacking larvae of *I. trilineatus*. The total parasitism of the pupae was 36·79 per cent.

WATSON (E. B.). **An Account of the Eastern Hemlock Looper, *Ellopia fiscellaria* Gn., on Balsam Fir.**—*Sci. Agric.* 14 no. 12 pp. 669–678, 1 pl., 1 graph, 1 ref. Ottawa, August 1934. (With a Summary in French.)

Investigations were carried out during 1929–30 on an outbreak of *Ellopia fiscellaria*, Gn., on balsam fir (*Abies balsamea*) in Quebec, where it first occurred in 1928 [*R.A.E.*, A 20 448]. The infestation, which was distributed unevenly, was characterised by the red appearance of the foliage, particularly in August, and by the dead and half-eaten needles hanging from the twigs by silken threads spun by the larvae. It appeared to be heavier in pure stands of balsam, though firs have been severely defoliated in stands containing up to 45 per cent. spruce. Spruce may be infested, particularly seedlings, and the injury is usually more severe on *Picea canadensis* than on *P. mariana*. The occurrence of the larvae on birch is considered to be accidental. Firs that have been completely defoliated in the summer generally die in the following winter and spring, but others may bud out again. Trees affected by the recent outbreak will probably continue to live, as the only serious secondary insect, *Monochamus marmorator*, Kby. [*cf.* 13 194] appears to be scarce.

The eggs are laid in September, singly or in small groups, and may be found almost anywhere, though cracks in the bark of dry stumps are preferred sites for both oviposition and pupation. The larvae hatch in the following June and move about freely in search of suitable food, but often ascend trees that do not provide it. On balsam fir, they feed on the new foliage and, even on small trees, tend to concentrate round the terminal shoot; the older ones ascend the larger trees, about 90 per cent. usually being confined to the upper fifth. They pupate at the end of July or the beginning of August, and the adults emerge in September, some surviving until mid-October. It appears possible that the sudden reduction in infestation in 1929–30 may have been due to the abnormally wet summers of these years following the hot

and dry one of 1928. A slight condensation of moisture in the breeding cages caused high mortality. The application of calcium arsenate or other dusts by aeroplane [cf. 22 497] is considered impracticable over areas of 50 sq. miles or more. An alternative is to fell all balsam firs 4 ins. in diameter and over, thus removing all dead and dying trees before the onset of decay, which renders the wood unfit for pulping, and causing the death of the larvae in the following spring through starvation. The larvae cannot live longer than 4 days without food, and it appears improbable that the birch and small seedlings left standing would sustain them for long. They would be unlikely to migrate far, and the old foliage on the branches and tops of felled trees would not be acceptable as food.

PETERSON (A.). **A Manual of Entomological Equipment and Methods.**

**Part I.**—Demy 4to [2] 21 pp., 138 pls., [12] xiii pp. Ann Arbor, Mich., Edward Bros, Inc., 1934. Price \$3.75.

This manual, which contains information (some of which is published for the first time) compiled from numerous sources, chiefly in the United States and Canada, is the first of a series intended for the use of research workers and students taking a course on methods of research with living insects in the Ohio State University. It includes discussions on field insectaries and on the influence of various environmental factors within cages and containers, but consists largely of original outline drawings of equipment, together with explanations and references to the publications in which they may be found or to the names of the contributors. Miscellaneous tables and indices to authors and contributors and to the subject matter are appended.

PENTZER (W. T.). **Removal of Lead and Arsenic Spray Residues from New York Apples.**—*Bull. Cornell agric. Exp. Sta.* no. 604, 27 pp., 5 pls., 5 refs. Ithaca, N.Y., May 1934. [Recd. September 1934.]

The following is largely taken from the author's summary: Cleaning tests with apples sprayed with lead arsenate in western New York indicated that wipers and brushes alone cannot be depended upon to clean fruit carrying lead and arsenical residues more than  $1\frac{1}{2}$  times the tolerances [*R.A.E.*, A 22 183]. They were generally cleaned successfully with 1 per cent. hydrochloric acid (about 3 gals. to 100 of water), but after a heavy application late in the season 1.5 per cent. was sometimes necessary, and in one type of brush washer even this concentration at 100°F. proved inadequate. The addition of Vatsol or other wetting agent to the 1.5 per cent. HCl gave satisfactory results at 75 and 100°F., but some injury resulted to the skin round the calyx. As McIntosh apples were slightly injured by acid solutions at 100°F., 90–95°F. is recommended as a safe limit for washing this variety. Those with more waxy fruit may withstand temperatures of 100–110°F., and sometimes 120°. A variety of pear was injured at 110°F. Some McIntosh apples were injured by exposure for 5 minutes to the 1.5 per cent. concentration at 75°F. Careful handling of fruit is necessary to avoid skin abrasions that allow the entrance of fungi. The use of clean acid and rinsing solutions and abundant rinsing water also prevents contamination.

METZGER (F. W.). **Traps for the Japanese Beetle and how to use them.**—*Misc. Publ. U.S. Dep. Agric.* no. 201, 11 pp., 4 figs. Washington, D.C., June 1934. [Recd. September 1934.]

In this revised paper [cf. *R.A.E.*, A 21 40], recommendations are given for the use of the standard trap [19 354] for the Japanese beetle [*Popillia japonica*, Newm.] in the United States and an improved form [22 410], which is more efficient but may be less readily available commercially. The liquid bait [21 336] is cheaper and more durable than the solid one [19 355].

FLEMING (W. E.), METZGER (F. W.) & OSBURN (M. R.). **Protection of Orchard and Shade Trees and Ornamental Shrubs from Injury by the Japanese Beetle.**—*Circ. U.S. Dep. Agric.* no. 317, 7 pp., 6 figs. Washington, D.C., July 1934. **Protecting Plants in the Home Yard from Injury by the Japanese Beetle.**—*Op. cit.* no. 326, 13 pp., 8 figs., 2 refs.

In the first circular, it is stated that the foliage and fruit of plants may be protected from attack by the adults of the Japanese beetle [*Popillia japonica*, Newm.] by the application as repellents of sprays of 32 lb. hydrated lime or of 6 lb. acid lead arsenate and 4 lb. wheat flour (or 2 lb. powdered skim milk or enough oil to give the diluted spray an oil content of 0.5–0.6 per cent.), both in 100 U.S. gals. water. The lime spray should be used for early apples, peaches and plums; the arsenical spray may be applied to late apples and the foliage of cherries after harvest. Either may be used to protect the foliage of grapes (the fruit of which is not attacked) or the lead arsenate may be added (without the flour) to the Bordeaux spray applied about the latter part of June. Lead arsenate with flour or 1½ U.S. pints light-pressed fish oil in 100 U.S. gals. water will protect the foliage of shade trees and ornamental shrubs and with the oil gives satisfactory results on young apple stock. At least two applications will generally be necessary, and fruit may require washing or wiping before being marketed.

The second circular contains brief information on the various measures for the control of *P. japonica* that are suitable for use in gardens, etc.

CRESSMAN (A. W.) & DAWSEY (L. H.). **Oil Retention, Oil-Emulsifier Ratio, and Oil-Water Ratio as affecting the Insecticidal Efficiency of Emulsions.**—*J. agric. Res.* 49 no. 1 pp. 1–19, 9 figs., 14 refs. Washington, D.C., 1st July 1934.

The following is taken from the authors' summary of field and laboratory tests of emulsions of a mineral oil (Saybolt viscosity at 100°F., 86 seconds; unsulphonated residue, 98.8 per cent.) on *Pseudaonidia duplex*, Ckll., on camphor (*Cinnamomum camphora*) in Louisiana: The percentage of scales killed varied inversely with the density of population, whether a light or a heavy oil deposit was left on the tree. Oil deposit and insecticidal efficiency varied inversely with the concentration of soap emulsifier (sodium or potassium oleate) in the aqueous phase of the emulsions (from 0.015 per cent. upwards) and directly with the concentration of oil (0.6 and 1.7 per cent. concentrations killing 33.8 and 83.2 per cent., respectively, on potted plants). Sprays that left deposits of from 0.016 to 0.104 mg. oil

per sq. cm. of leaf surface gave from 10 to 99 per cent. control, the results varying with the age and generation of the scales and the density of population. The rate of increase in control per unit increase of oil residue was more rapid with small quantities of oil than with large. The susceptibility of the adult scales decreased with age.

FLEMING (W. E.) & BAKER (F. E.). **Testing Contact Insecticides on the Japanese Beetle, and Results with some Sodium and Potassium Soaps.**—*J. agric. Res.* **49** no. 1 pp. 29–38, 4 refs. Washington, D.C., 1st July 1934.

In tests of contact insecticides against *Popillia japonica*, Newm., in the United States [*cf. R.A.E.*, A **21** 458], batches of 100 beetles were immersed in different concentrations of various soaps for 2 minutes and then kept at 80°F. and 96 per cent. relative humidity for 24 hours. As the susceptibility of the beetle varied during the year, neutral potassium oleate, the median lethal concentration of which ranged from 1.83 to 3.21 gm. per litre, was used as a standard insecticide in all tests. Its insecticidal efficiency (reckoned as 1) was altered to 0.82 and 1.35 respectively by the addition of 10 per cent. excess oleic acid or potassium hydroxide, that of neutral sodium oleate being 1.225. The efficiency of the neutral potassium soaps of saturated fatty acids increased with the molecular weight, only the myristate having a higher efficiency (1.28) than the oleate. The efficiencies of the potassium soaps of miscellaneous vegetable oils were as follows: soy-bean, 1.197; cottonseed, 1.218; raw linseed, 1.109; boiled linseed, 1.057; blown castor, 0.854; ground-nut, 0.821 and coconut, 0.659.

FLEMING (W. E.) & BAKER (F. E.). **The Effectiveness of Stomach-poison Insecticides on the Japanese Beetle.**—*J. agric. Res.* **49** no. 1 pp. 39–44, 4 refs. Washington, D.C., 1st July 1934.

The effectiveness of several stomach poisons against *Popillia japonica*, Newm., in the United States was determined under controlled conditions [*cf. R.A.E.*, A **22** 322]. In each test, 1,000 beetles were confined in 5 cages without food (so that their mortality could be subtracted from that of the poisoned ones to allow for the repellent action of the insecticide on some individuals), 1,000 with plants sprayed with commercial acid lead arsenate (8 lb. to 100 U.S. gals., which proved slightly more effective than higher dosages), and 1,000 with plants sprayed with the material to be tested. The efficiency of 8 lb. lead arsenate being reckoned as 1, the values of 1, 2, 4 and 6 lb. were respectively 0.4, 0.7, 0.84 and 0.9. The spray was applied 24 hours before the beetles fed, and half the leaves were washed with the equivalent of 1 inch of rain, which reduced the efficiency of the standard 8 lb. spray to 0.61. Its efficiency on unwashed and (in brackets) washed foliage with the following additions was: 1 per cent. lead oleate, 1.3 (0.89); 2 lb. fish oil, 1.25 (1.185);  $5\frac{1}{2}$  lb. flour, 1.68 (1.41). The efficiencies of other materials were: as dusts, nicotine and anabasine sulphates (5 per cent., absorbed on bentonite) 0.22 and 0.03; 2-phenylbenzothiazole, 0.33; pure powdered rotenone, 0.73; dihydro-rotenone and fish oil (4:1), 0.98; and as sprays (per 100 U.S. gals), 8 lb. barium arsenate, 0.52; 8 lb. calcium arsenate, 0.32; 8 lb. cuprous cyanide (paste containing 43 per cent. CuCN), 0.37; 40 and 60 lb. derris (containing 4 per cent. rotenone) 0.68 and 1.41.

SCHAAL (L. A.). **Relations of the Potato Flea Beetle to Common Scab Infection of Potatoes.**—*J. agric. Res.* **49** no. 3 pp. 251–258, 4 figs., 9 refs. Washington, D.C., 1st August 1934.

The tracks made by larvae of *Epitrix cucumeris*, Harr., on potato tubers in Colorado become infected with the scab fungus, *Actinomyces scabies*. The percentage of infected tracks was greatly reduced in tubers grown from seed potatoes that had been immersed for  $1\frac{1}{2}$  hours in mercury bichloride (1 : 1,000) [*cf. R.A.E.*, A **18** 216]. Larvae collected from the field harboured the fungus internally and externally. It was not cultured from the outside of the eggs, and larvae from disinfected eggs did not carry it. Tracks made by sterile larvae on tubers grown in sterilised soil did not become infected, but larvae from infected soil placed among tubers in sterilised soil produced infected tracks.

LEIBY (R. W.). **Insect Survey Work in North Carolina.**—*J. econ. Ent.* **27** no. 4 pp. 735–739. Geneva, N.Y., August 1934.

A brief account is given of the work, begun in 1900 by Professor F. Sherman, of collecting and recording the fauna of North Carolina, of which insects, comprising 8,704 species, compose 80 per cent. Instances of the practical uses of the survey in identifying insect pests are quoted.

GAINES (J. C.). **A preliminary Study of Thrips on Seedling Cotton with special Reference to the Population, Migration and Injury.**—*J. econ. Ent.* **27** no. 4 pp. 740–743, 3 figs. Geneva, N.Y., August 1934.

Weekly records of the incidence of thrips, chiefly *Frankliniella tritici*, Fitch, and *Sericothrips variabilis*, Beach, but including small numbers of *F. fusca*, Hinds, in a cotton field in Texas were made by counts on 10 cotton plants collected at random. In low-lying land, the numbers of thrips increased from 14 on 19th April to 620 on 7th June, while nymphs of the cotton fleahopper [*Psallus seriatus*, Reut.] increased from 0.1 on 3rd May to 1.2 on 7th June. Corresponding figures for plants in upland situations were 6 to 547 and 0.1 (17th May) to 0.5. Thrips were first found on the two-leafed seedlings on 19th April, about the time that the cotton was up to stand. Malformed, injured plants were definitely noticeable by 2nd May, before either fleahoppers or Aphids had established themselves. By 7th June, when the records were discontinued, the cotton had attained a height of about 20 inches. Injured cotton seedlings are later characterised by the occurrence of two or more main branches, and sometimes by excessive branching of the vegetative branches.

Data obtained by means of an adhesive screen showed that thrips were drifting over the fields before the cotton was up to stand. The fact that maximum abundance on a trap in an adjacent field occurred on 3rd May, a week before that in the cotton fields themselves, indicated that the thrips migrated from weed fields to cotton in large numbers.

In observations in which 50 plants in succession at each of two points were labelled for weekly square, bloom and boll records, 35 per cent. were injured by thrips early in the season. The uninjured plants began to set bolls at least 2 weeks earlier than these and produced 56 per cent. more bolls. Four injured and four normal plants produced respectively 36 and 78 bolls.

RUGGLES (A. G.). **Springtail or Thysanuran Injury.**—*J. econ. Ent.* **27** no. 4 p. 743. Geneva, N.Y., August 1934.

The Thysanuran, *Campodea fragilis*, Mein., is recorded as feeding on radishes in a greenhouse in Minneapolis.

FOLSOM (J. W.). **Insectary Notes on the Field Cricket.**—*J. econ. Ent.* **27** no. 4. pp. 744–745. Geneva, N.Y., August 1934.

Studies of *Gryllus assimilis* var. *pennsylvanicus*, Burm., which feeds on cotton every year in Louisiana and may inflict serious damage on young plants in time of drought [*R.A.E.*, A **19** 668], have been carried out for 4 successive years. The overwintered nymphs of the second generation reach the adult stage in April and May, and most of them have died off by 15th June. Adults of the first (summer) generation appear about 15th July, continue to emerge until early September and die off by about 15th October. In 1933 pairing occurred in April, and 5 females laid a total of 1,416 eggs between 19th April and 1st June. The maximum number of eggs laid by one female was 808. The egg period varied from 21 days in May at 70°F. to 9 in July at 81°F. The number of moults, which varied from 9 to 12, was determined by marking nymphs with a spot of aluminium paint on the pronotum. Cooler weather prolonged nymphal development and increased the number of moults. Characters distinguishing the instars in the field are shown.

GAINES (R. C.). **The Development of the Boll Weevil on Plants other than Cotton.**—*J. econ. Ent.* **27** no. 4 pp. 745–748, 1 fig. Geneva, N.Y., August 1934.

In further studies on *Anthonomus grandis*, Boh., in Louisiana [*cf. R.A.E.*, A **21** 654], 58 plants representing 4 species of *Hibiscus* were grown in an infested cotton field 10–12 feet apart with cotton plants growing between them and in adjoining rows. In buds collected from *H. syriacus* in August–September, 7 boll-weevils developed, emerging after 10–16 days. This is apparently the first time that *A. grandis* has been found breeding in a plant other than cotton or *Thurberia* under field conditions. *H. syriacus* is used extensively as an ornamental plant in the United States. An attempt to rear a second generation on it was unsuccessful. No weevils developed in *H. militaris*, *H. lasiocarpus*, or okra (*H. esculentus*), though adults were observed in the blooms of the first two. In cages, they fed on blooms of all the species.

YOUNG (M. T.). **Field-plot Tests for Boll Weevil Control at Tallulah, La., during 1933.**—*J. econ. Ent.* **27** no. 4 pp. 749–756. Geneva, N.Y., August 1934.

In Louisiana in 1933, 8 cotton fields were divided into comparable plots of which one was untreated and the others dusted with various insecticides for the control of *Anthonomus grandis*, Boh. All applications were begun as soon as 10 per cent. of the squares had become infested and were repeated (between daybreak and 7.30 a.m.) at 4-day intervals so far as weather conditions permitted. If heavy rain occurred within 24 hours of an application, it was considered ineffective and another one made. Weekly records of the percentage of squares

infested were begun as soon as the plants had 4-5 squares large enough to be punctured by *A. grandis*, and were continued until the average number of squares to a plant was less than 4-5. Yield records were based on pickings from selected areas from those parts of the plots least liable to be affected by the adjacent ones.

The following figures show the estimated yield of seed cotton in lb. per acre from one field following 7 effective applications of various dusts: untreated, 792; calcium arsenate (at an average rate of 5.3 lb. per acre in each application), 1,077; sodium fluosilicate (8.7 lb. or 4.7 lb. per acre), 727 and 657 respectively, with some scorching of foliage; cryolite (sodium fluoaluminate) (6 lb.), 781; barium fluosilicate (5.4 lb.), 823. In another field, calcium arsenate and Paris green (3:1), especially when wet-mixed, gave better results in some tests than calcium arsenate alone, but tended to scorch the foliage. Calcium arsenate and copper arsenite (3:1 or 4:1) appeared to give very good control of *A. grandis*, but the yields were not so great as on the plot treated with calcium arsenate alone. The results of applying calcium arsenate with a combined cultivator and duster were variable and inferior to those of dusting with hand guns; this mode of application is nevertheless considered to offer some promise. The 9 plots treated with the standard calcium arsenate by the standard method gave an average increase of seed cotton of 419 lb. per acre, or 45.4 per cent., over the untreated control plots.

**RAINWATER (C. F.). Insects and a Mite of potential Economic Importance found on Wild Cotton in Florida.**—*J. econ. Ent.* 27 no. 4 pp. 756-761, 4 refs. Geneva, N.Y., August 1934.

*Rhodoneura terminalis*, Wlk., *Contarinia gossypii*, Felt., *Eriophyes gossypii*, Banks, *Nepticula gossypii*, Forbes & Leon., and *Anomis impasta*, Gn., all occur in southern Florida on perennial wild cotton plants closely allied to *Gossypium hirsutum*, from which the upland varieties of cultivated cotton have been developed. The fruiting season of this wild cotton extends from early October to late April, and it is confined to areas below the frost line, chiefly in the lower peninsula and the adjacent islands.

The larvae of *R. terminalis* severely injure wild cotton by boring into the bolls, blooms and squares. If these are absent, they tunnel down the stems for a distance of 2-5 inches before they emerge to pupate. Although under laboratory conditions pupae sometimes occurred within the squares, blooms or bolls, none was observed in the stems or fruit in the field, and it is probable that the larvae all pupate in the soil. In the laboratory, the pupal stage lasted 7-18 days. The local distribution of this Thyrvid is practically coincident with that of the wild cotton, the degree of infestation being sometimes as high as 62 per cent. of the fruit and almost 100 per cent. of the stems.

*Contarinia gossypii*, which was found on 17th September 1932, apparently for the first time in the United States, has been recorded as occasionally attacking the flower-buds of cotton in St. Croix, and caused very serious loss of crop in Antigua in 1907. In Florida, the squares and bolls were attacked as well as the blooms. The bracts of infested blooms flare back, the petals closing inwardly from the tips. At this stage, the inner parts of the blooms are partly decayed and have a characteristic odour. The blooms soon dry up, become brittle and drop. Similar injury is caused to the squares. From examination of

infested bolls, it appears that the adult female deposits eggs on the inside of the boll, after piercing it with her ovipositor. The larvae apparently bore through to the seed, where they prefer to feed. The surrounding lint becomes discoloured and decomposes, and the seeds finally shrivel up. An undescribed Chalcid of the genus *Zatropis* was reared in fairly large numbers from squares, blooms and bolls infested by this Cecidomyiid.

*Eriophyes gossypii*, which is known to occur in Martinique, Nevis, Barbados, Porto Rico and the Virgin Islands, had not been recorded from the United States before its collection from wild cotton and sea island cotton on Keys south of Florida in 1932. Scattered colonies have since been found on the mainland. The mites cause wart-like protuberances, and infested plants are dwarfed or killed. Seedlings suffer most.

*Nepticula gossypii* [cf. *R.A.E.*, A **19** 198] was found in a few localities, mining in the leaves of wild cotton (which it causes to fall) and also in the bracts of the squares, blooms and bolls. A single example of the Eulophid, *Closterocerus cinctipennis*, Ashm., was reared from infested leaves. *Anomis impasta*, which was described from French Guiana, and has been reported on cotton in Brazil, Barbados and Cuba, was first reared from wild cotton blooms in Florida on 25th October 1932.

**ISELY (D.). Relationship between early Varieties of Cotton and Boll Weevil Injury.**—*J. econ. Ent.* **27** no. 4 pp. 762–766, 1 ref. Geneva, N.Y., August 1934.

Experiments on the advantages of relative earliness of cotton in relation to injury by the boll-weevil [*Anthonomus grandis*, Boh.] have been carried on intermittently since 1926 in Arkansas. In 1926 and 1927, one-half of each of a number of field plots bearing a typical early, medium early and late variety of cotton was dusted in an attempt to remove the factor of weevil injury. Although cotton was planted on the same date (17th–18th May) each year, the two seasons were quite different in their effect on the rate of development of the squares. In 1926, on 11th and again on 18th August, 60 newly transformed weevils were released in the middle of each plot, and the plots were evenly infested by 1st September. In 1927, infestation occurred naturally by overwintered progeny of weevils liberated in the previous year. In 1926 four dust applications were made between 3rd and 15th September, and in 1927 three between 16th and 25th August. The differences in yield for the two years, though not solely attributable to weevil injury, show plainly that late varieties are much more susceptible to it and that there is much less advantage in dusting rapidly maturing early cotton.

In a similar type of experiment in another locality in 1929, infestation by overwintered weevils was scattered but light. A fairly evenly distributed infestation appeared when the first generation matured. Three dust applications were made, beginning in the latter part of July, when the percentage of squares punctured reached about 35. Severe drought during August checked both weevil injury and late fruiting of cotton. Although the weevil damage was much less than average and the yield was affected by other factors, there was a marked tendency for gains of yield due to dusting to increase with the lateness of the varieties. The highest yield of undusted cotton was, with one

exception, produced by the earliest varieties. In view of the results hitherto obtained, it is recommended to plant only the earliest varieties in situations subject to regular annual attack by *A. grandis*. Where weevils do not regularly invade cotton before midsummer, medium early varieties may be grown; and on light sandy uplands, where sudden checking by drought frequently occurs and both weevil injury and plant growth tend to be small, the factor of earliness may be ignored. The fruiting period of a variety is greatly modified by the moisture supply, soil type and soil management; varieties that have a long fruiting period in low-lying land have a short, almost determinate, fruiting period in the light sandy uplands.

In experiments where control of *A. grandis* has been the only purpose, gains from dusting have averaged about 120 per cent., but plots used for such tests were always situated in the midst of heavy infestations. Under such conditions, the advantages of earliness would no doubt be greater than in the tests reported on. An extra early variety may have further use as a weevil control trap, but such a trap is of value only where early infestations of overwintered weevils are known to occur annually. In experiments, the sharp difference between the infestation of the trap variety and the main planting has always justified early dusting of the trap-crop.

STRACENER (C. L.). **Insects of stored Rice in Louisiana and their Control.**—*J. econ. Ent.* **27** no. 4 pp. 767-771, 1 ref. Geneva, N.Y., August 1934.

A study in Louisiana of samples of rice obtained from warehouses showed an average infestation by insects in the 1931 crop of 20 per cent., with a total loss of weight of 16 per cent. The total loss in the 1932 crop was smaller (14 per cent.) owing to the more severe winter of 1932-33. When estimated on the average of rice production for 1920-32, this would represent an annual loss of about £200,000.

The insects responsible for 95 per cent. of the damage to rough rice are, in order of injuriousness, *Rhizopertha dominica*, F., *Sitotroga cerealella*, Ol., and *Calandra* (*Sitophilus*) *oryzae*, L. Some loss in cleaned rice is also caused by *Tenebroides mauritanicus*, L., *Tribolium confusum*, Duv., *Laemophloeus minutus*, Ol., *Cathartus quadricollis*, Guér., and *Silvanus* (*Oryzaephilus*) *surinamensis*, L. *Tenebroides* will also attack uninfested rough grain, but prefers clean rice. The less important species probably depend upon other insects to break through the rough covering of the grain, or only feed on hulled grains.

Of samples obtained from the fields when the 1932 crop was harvested, 8 per cent. were infested by insects, and of those obtained from warehouses in January, early April and mid-June 1933, 17.5, 47.7 and 97.4 per cent. respectively. This indicates that spread within the warehouse is very rapid. It is suggested that control might be effected in warehouses by fumigating late enough in the season for the bulk of the rice to have been milled, and yet early enough to avoid serious damage by insects and before the new crop in the field is advanced to the stage at which fresh infestation is possible.

As treatment of the entire crop is impossible, it is suggested that fumigation between 1st June and 15th July, when only 10-15 per cent. of the crop remains unmilled and the stock of rough rice in storage is low, would probably mean practical control if carried out by all warehouses in conjunction with treatment of the very small crop of maize in

the area. The merits of various fumigants are discussed, particularly in relation to the difficulty of penetrating rice when in sacks. It was found that carbon bisulphide is non-inflammable when used at the rate of  $5\frac{1}{2}$  lb. per 1,000 cu. ft. and mixed when in the gaseous state with about  $4\frac{1}{2}$  times its volume of carbon dioxide (which increases its toxicity by stimulating respiration) and is thoroughly toxic to *T. mauritanicus* in both the adult and larval stages. This insect is the most difficult to kill of any species attacking stored grain. Different methods of mixing carbon dioxide with carbon bisulphide and other inflammable fumigants are discussed. One of these is to generate carbon dioxide by mixing sodium bicarbonate with a dilute acid. The carbon bisulphide may be poured directly into the sodium bicarbonate without chemical combination or deterioration other than normal evaporation, the proportion being such that the sodium bicarbonate is not saturated to any extent. When the dilute acid is added to this mixture, the chemical reaction is not hindered by the presence of the carbon bisulphide, which the evolution of carbon dioxide tends to vaporise so that the two are liberated simultaneously. In laboratory tests, all adults and larvae of *Tenebroides* and of *Tribolium* were killed with this combination, even when the concentration of carbon bisulphide was only equivalent to 1.4 lb. per 1,000 cu. ft.

SNAPP (O. I.) & THOMSON (J. R.). **Further Experiments in the Control of the Peach Borer on Nursery Stock and Orchard Trees.**—*J. econ. Ent.* **27** no. 4 pp. 771–779, 1 ref. Geneva, N.Y., August 1934.

Further experiments [*cf.* R.A.E., A **20** 632] were carried out in Georgia in 1932 and 1933 on the control of *Aegeria exitiosa*, Say, the importance of which has recently been enhanced by the suggestion that it may spread phony peach disease [**21** 228]. During the spring of 1933, ethylene dichloride applied to 10-year-old peach trees at the rate of 2 fl. oz. per tree killed all the borers provided that it was covered with soil. It did not kill the eggs, and a higher rate of application injured the trees. An emulsion of ethylene dichloride carrying 1 or 2 fl. oz. to each tree gave good control but caused slight injury to several trees. Carbon tetrachloride was less effective than ethylene dichloride. Details are given of the effects of spraying the base of the trees with emulsions of ethylene dichloride or of crude cottonseed oil or mineral oil in which paradichlorobenzene had been dissolved at the rate of 2 lb. per U.S. gal. The mineral oil gave as good control as the cottonseed oil, but liberated the paradichlorobenzene more rapidly, so that injury to the trees resulted. Severe injury was caused when kerosene or petrol was used with the paradichlorobenzene.

On the basis of these results, it is recommended that trees up to 5 years old should be sprayed with  $\frac{1}{2}$  U.S. pint cottonseed oil emulsion carrying  $\frac{1}{16}$ ,  $\frac{1}{8}$ ,  $\frac{1}{4}$  and  $\frac{1}{2}$  oz. paradichlorobenzene to each tree for nursery stock and for those 1–2, 3 and 4–5 years old, respectively. Trees 6 years old or older should receive 1 U.S. pint of the emulsion carrying  $\frac{3}{4}$  oz. paradichlorobenzene. These dosages will kill the eggs of *A. exitiosa* as well as the larvae. The spray should be applied at the end of the oviposition period of the moth (10th–15th October for central Georgia) and afterwards covered with several shovelfuls of soil to prevent surface loss. Material for spraying 1,000 nursery trees will cost about 8s. [at par].

MARCOVITCH (S.). **The Woolly Aphis in Tennessee.**—*J. econ. Ent.* **27** no. 4 pp. 779–784, 8 refs. Geneva, N.Y., August 1934.

The following is mainly taken from the author's summary : *Eriosoma lanigerum*, Hsm., is an important pest of apple in Tennessee, especially on nursery stock. The roots become knotted and finally decay, trees with severely knotted root systems being unfit for sale. A constant temperature of 68°F. seems to be near the optimum for the development of the Aphid. At a constant temperature of 100°F. and 40 per cent. relative humidity, the young survived only 40 minutes. As soil temperatures often reach 100°F. or over, the summer mortality is high, and during hot, dry summers the root forms seem to disappear almost entirely. Elm trees near nurseries should be destroyed or the rosette galls [*cf. R.A.E.*, A **20** 3] removed from them before 20th April, at which date the migrants are ready to fly to apple. The aerial forms may be readily controlled by a spray of nicotine (1 : 1,000) with 3 lb. soap per 100 U.S. gals. The best control of the root forms was obtained by applying a 2 or 0.5 per cent. emulsion of miscible carbon bisulphide [*cf. 22* 571] to the soil at the rate of  $\frac{1}{2}$  or  $1\frac{1}{2}$  U.S. pints, respectively, per sq. ft. In heavy or dry soils, a higher dosage was required. On account of the cost and the large amount of water required, this treatment is practical only in newly planted orchards where infestation is heavy.

Root infestation takes place by migration of the aerial forms through cracks in the soil, as has been observed with *Phylloxera* on grape in the United States [**16** 453]. Studies carried out by growing greenhouse grafts in trenches containing different types of soil showed the following percentages of infestation : clay soil, 96.7 ; residual silt loam, which cracks badly in dry weather, 89.5 ; residual gravelly loam, 43 (or when mulched with 3 inches of sandy loam, 14.5) ; sandy loam, which does not crack, 3. Varying degrees of soil moisture did not appreciably affect infestation.

STANLEY (W. W.), MARCOVITCH (S.) & ANDES (J. O.). **A preliminary Report on the Use of Creosote Oil (Wood Oil) to control San José Scale and Peach Leaf Curl.**—*J. econ. Ent.* **27** no. 4 pp. 785–788. Geneva, N.Y., August 1934.

Particulars are given of the composition and physical properties of a crude hardwood creosote oil that has been tested in Tennessee during 1931–33 against the San José scale [*Aspidiotus perniciosus*, Comst.] and peach leaf-curl. The stock emulsion consisted of 3.6 lb. powdered lignin pitch (which proved a better emulsifier than soap) dissolved in  $1\frac{1}{2}$  U.S. gals. hot water to which 3 U.S. gals. of the oil was slowly added while the materials were being forced through a hand pump. After having been pumped through three times, the emulsion did not break down when exposed to freezing temperatures. The sprays were applied at 300 lb. pressure with a power sprayer on favourable days between 14th and 26th January. The results have already been noticed [*R.A.E.*, A **22** 569].

REED (W. D.), MORRILL jr. (A. W.) & LIVINGSTONE (E. M.). **Experiments with Suction Light Traps for combating the Cigarette Beetle.**—*J. econ. Ent.* **27** no. 4 pp. 796–801, 2 figs. Geneva, N.Y., August 1934.

The adults of *Lasioderma serricorne*, F., spend most of their life in semi-darkness or diffused daylight. They are attracted to a moderate

light, but are repelled by sunlight or strong electric lights. Various methods hitherto in use for trapping them during their period of activity and migration, which occurs about sunset, are discussed. A trap is described consisting of a sheet metal cylinder in which is fastened a 0.05 h.p. electric motor with fan blades attached to act by suction. A reflector of blocked tin is soldered round the open end of the cylinder, with an electric light socket fastened into it. A 20-mesh bright steel or copper screen-wire cone is fastened to the rear of the cylinder by a metal collar, and a tin elbow 3 ins. in diameter is soldered to the neck of the cone and fitted to a glass jar at the other end. A modification of this trap, in which a cheesecloth bag (22×34 ins.) fastened by a draw-string is substituted for the cone and jar, was also effective, but made it more difficult to handle the beetles. The trap is designed to operate suspended from the ceiling near an electric light so that it may be operated from a double socket. The suction fan must revolve continuously to prevent the escape of the beetles. Collections at weekly intervals were most satisfactory. A jar of 1 U.S. pint capacity accommodates 150,000 beetles. Large catches of beetles were made with bulbs of 15–75 watt capacity, but a 100-watt bulb appeared to repel them. They were killed in the laboratory with chloroform and sifted through a 14-mesh screen, and the numbers estimated by placing them in graduated glasses previously calibrated. This method was more accurate than weighing and quicker than counting.

In 7–14 traps operated from 11th August to 10th November in open tobacco warehouses in the bright tobacco belt of the United States containing about 2,500,000 cu. ft. of storage space, nearly 5,400,000 beetles were caught. The largest weekly catches (from 875,500 to 1,270,100) were made between 25th August and 6th September, when temperatures were high. The beetles were largely inactive below 65°F., and the greatest weekly catch during the cool weather prevailing after 6th September was less than 70,000. Increased humidity after rainy days appeared to have little effect on the activity of the beetles. In a closed storage tobacco warehouse containing 3,125,000 cu. ft. in which traps were operated from 19th September to 5th November, the largest catch was made between 30th September and 6th October when 22 traps caught an average of about 74,000 beetles each. Temperature again appeared to be the controlling factor. No statement can be made as to the degree of control obtained, as it is not possible to determine the insect population of storage warehouses. No conclusions as to control can be drawn from the fall in numbers after 6th September, as trapping was not carried out throughout the active season of the beetles (May–November). Although fumigation is more effective than trapping in closed warehouses, the latter method should prove useful in the open buildings in which much tobacco is stored while aging.

KEARNS (C. W.). **A Hymenopterous Parasite** (*Cephalonomia gallicola* Ashm.) new to the Cigarette Beetle (*Lasioderma serricorne* Fab.).—*J. econ. Ent.* **27** no. 4 pp. 801–806, 1 fig., 6 refs. Geneva, N.Y., August 1934.

*Cephalonomia gallicola*, Ashm. (of which *C. quadridentata*, Duchaussoy [cf. *R.A.E.*, A **20** 194] may be a synonym) was discovered in Illinois in October 1933 in a culture of *Lasioderma serricorne*, F., from stored tobacco in Virginia. The egg, larva and three adult forms of this

Bethylid are described. The eggs are laid on full-grown larvae, prepupae, or pupae of *L. serricorne*, as many as 9 eggs being sometimes laid on a single host. At 20–26°C. [68–78.8°F.], they usually hatched in 2–4 days. The method of oviposition is described. The larvae feed through punctures made in the body wall of the host by the mother before oviposition or by their own mouth-parts. The larvae usually cease feeding after 2–3 days and construct silken cocoons within that of the host, where they remain quiescent for 3–5 days. The pupal stage lasted 11–18 days for females, 9–15 for winged males and 7–12 for wingless males. The completely developed adults remain in their cocoons for 1–3 days. Ordinarily both males and females develop upon the same host and spin adjoining cocoons. Unfertilised females produced males only. The female invariably chooses hosts already enclosed in cocoons, within which she remains for a period varying from a few hours to 2 days, feeding and laying eggs. A single female laid 158 eggs on 76 hosts over a period of 36 days, besides killing 21 by feeding punctures. When hosts are scarce, a greater number of eggs is apparently laid on individual ones. The feeding of a single larva is sufficient to cause the death of its host.

The parasite can maintain itself under adverse climatic conditions at least as well as the host, the slender, wingless females can enter tiny crevices and penetrate deeply into tightly packed tobacco, and there is no danger of their being attracted to light-traps.

MARSHALL (G. E.) & WILBUR (D. A.). **The Clover Root Curculio** (*Sitona hispidula* Fab.) in Kansas.—*J. econ. Ent.* **27** no. 4 pp. 807–814, 2 figs., 4 refs. Geneva, N.Y., August 1934.

With the decrease in the acreage of lucerne cultivated in Kansas since 1919, there has been a marked increase in the incidence of lucerne pests. A study was begun in 1928 of the weevils affecting lucerne, with special reference to *Sitona hispidula*, F., which was first recorded in the State in 1923, on white clover. The larvae destroy the root system of lucerne and sweet clover [*Melilotus*], frequently girdling the tap-roots from the surface to several inches below, and the adults feed on the leaves during the summer and autumn. Gouges made by the larvae on the tap-roots occur in Kansas when the soil is warm and moist, affording an entrance for disease organisms. Owing to their small size, the weevils are often overlooked even when vast numbers are present, and the injury done to lucerne, which extends over the whole growing season, is not conspicuous at any one time.

The observed duration of the various stages elsewhere in the United States [*cf.* *R.A.E.*, A **18** 478] and in England [**10** 473] is set out. Oviposition was observed in Kansas from April to November, with a break in August. The greatest number of eggs laid within a given time by one female was 37 in two days. Many eggs are laid in autumn and probably overwinter, though in mild weather they hatch in 6–9 days. The larva crawls rapidly on hatching. If it has hatched from an egg laid on a leaf, it crawls until it falls to the ground, where it searches for a crack by which it can reach the roots. Larvae began feeding on nodules or roots within 20 minutes of having entered the soil. Larval activity in the soil was observed on young plants of lucerne or white clover caged in finely sifted soil between two glass plates held together

by heavy rubber bands, small bands of blotting paper holding the soil at the edges and absorbing moisture. The method of burrowing in the soil by the older larvae is described, 4-5 inches of straight burrowing being common. Each larva consumes several small feeding roots in succession. One may feed within a large nodule for 3-4 days, leaving nothing but the outer shell. Later they move towards the larger roots, concentrating round the tap-root as they attain full growth. At the end of May and beginning of June, many larvae of the fourth and fifth instars are found in certain lucerne fields. Representative counts showed 5.4 per plant and 25.6 per sq. ft., both 6 inches deep, or a population of over a million per acre. The preferred place for feeding of the older larvae is near the crown, thus facilitating the entry of diseases such as crown rot. In a test to determine how long the larvae can survive flooding by the spring rains, 34 hours was required to kill them in a cup of tap water.

The construction of the pupal cell is described; the largest number of pupae were found between 7th and 25th June, the pupal period varying from 8 to 16 days. Most of the adults emerge about 25th June, beginning to feed a few days later and continuing until cold weather sets in. They do not appear to aestivate, but in the hottest weather they feed in the upper part of the plant by night and move downwards during the day. Injury by *S. hispidula* is compared with that caused by *Hypera punctata*, F., and *Epicaerus imbricatus*, Say, both of which also attack lucerne in Kansas. Pairing occurs in autumn, and oviposition begins 12 hours later. The adults have been taken at various times hibernating in lucerne fields under debris, but it has not been possible to induce hibernation in cages.

No insect enemies were discovered, but about one larva out of six in a lucerne field in late May 1928 was found to be infested with a Nematode of the genus *Diplogaster*.

NETTLES (W. C.). **Pupal Parasites of the Oriental Fruit Moth in South Carolina—a preliminary Report.**—*J. econ. Ent.* **27** no. 4 pp. 814-817, 4 refs. Geneva, N.Y., August 1934.

From a number of pupae of *Cydia (Grapholitha) molesta*, Busck, collected from 22nd July to 16th September 1932 in South Carolina, 46 moths and 58 parasites emerged. From pupae collected under bands and from peaches at harvest, 73 parasites were reared, representing the following species: *Haltichella longicornis*, Ashm., *Brachymeria hammari*, Cwfd., *B. ovata*, Say, *Eupelmus limneriae*, How., *Encyrtaspis semirufus*, Gah., *Spilochalcis delira*, Cress., *Anastatus* sp., *Pimpla (Ephialtes) aequalis*, Prov., *Eupelmus cyaniceps* var. *amicus*, Ashm., *Eurytoma tylodermatis*, Ashm., and *Arachnophaga* sp. *H. longicornis* and *B. hammari* were responsible for about 60 per cent. of the total parasitism. These Chalcids both parasitised pupae in the insectary and emerged after a total developmental period of 15-18 days between late July and early August. Both were able to reproduce parthenogenetically. The average longevity of 19 adults of *H. longicornis* was 10.5 days (maximum 18, minimum 3) and that of 12 of *B. hammari* was 7.8 days (maximum 23, minimum 4). As the pupal stage of *C. molesta* is relatively exposed, it is more liable to parasitism than that of most insects.

MUNGER (F.), JONES (M. P.) & SIEGLER (E. H.). **A new Dipping Apparatus for treating corrugated Paper Bands for Use in Control of the Codling Moth.**—*J. econ. Ent.* **27** no. 4 pp. 817–820, 3 figs., 1 ref. Geneva, N.Y., August 1934.

In treating corrugated paper bands with beta-naphthol and oil [cf. *R.A.E.*, A **20** 403] for use in the control of the codling moth [*Cydia pomonella*, L.], it is advisable, in order to avoid clogging the tubes, to dip the roll of paper to half its depth in the hot solution and then remove it immediately; after this has cooled, the untreated half should be similarly dipped. In an apparatus that has been used for facilitating this process in Maryland, the roll rests on an iron rack, the level of which in the dipping tub is regulated by a vertical wrought iron bench screw, with a base consisting of two iron cross-pieces.

CHAPMAN (A. J.) & CAVITT (H. S.). **The Influence of Soil Moisture upon Survival of the Pink Bollworm.**—*J. econ. Ent.* **27** no. 4 pp. 820–827, 3 figs. Geneva, N.Y., August 1934.

In studies in Texas on the effect of soil moisture on the overwintering stages of *Platyedra* (*Pectinophora*) *gossypiella*, Saund., cotton bolls heavily infested with long-cycle larvae [cf. *R.A.E.*, A **20** 629] were buried in 2-gallon earthenware crocks filled with soil of various moisture contents, enough to make a layer  $2\frac{1}{2}$  inches deep below the bolls and another of the same depth above, leaving  $1\frac{1}{2}$  inches at the top to allow for watering. Two of the extreme soil types found in the Presidio Valley were used, clay-adobe and sandy loam. Three samples of each type, taken from the upper 6 inches of the field, were dried in an electric oven and the average percentage of soil moisture thus determined. Each crock was weighed at intervals of 2–4 days and enough water added to compensate for evaporation. The water was poured through glass tubes inserted in the soil, except in those crocks in which it was to be saturated. Variations in temperature in the different soils were found to be so slight that this factor evidently did not influence the percentages of survival. As the theoretical moisture content produced by frequent additions of water was found to represent the maximum rather than the mean percentage, the average minimum percentage of soil moisture in each crock for the duration of the experiment was found, and the mean percentage computed by averaging the other two.

Records of moths emerging in 18-mesh screen-wire cages over the crocks were made at regular intervals, and daily during the period of maximum emergence. In 1929–30, the highest percentage in sandy loam (5·36) survived when the mean moisture content averaged 17·3; no moths emerged when it averaged 21·86 or over. In clay-adobe soil, the maximum survival (39·29 per cent.) was when the moisture content was 10·1 per cent.; although some survival was recorded in moister soil, some of the larvae came to the surface and spun their cocoons there. In 1930–31 and 1931–32, the highest percentages (11·17 and 56·82) survived in sandy loam soil with 16·72 per cent. soil moisture, and in the clay the highest percentages (7·36 and 39·77) survived with moisture contents of 22·69 and 16·82 per cent. respectively (intermediate degrees of moisture not being tested). In the sandy loam soil there was a sudden decrease in survival when the soil moisture was above the optimum, whereas in the clay-adobe soil it was somewhat more gradual. Clay-adobe soils hold more moisture than sandy loam soils. No moths emerged from saturated soil of either type. Maximum emergence

from both types of soil occurred during May when the moisture content was above 5 per cent., and from dry soils in July. It appeared that the clay-adobe soil had a tendency to delay moth emergence.

**BRYSON (H. R.). Observations on the Summer Activities of *Aphis maidis* Fitch.**—*J. econ. Ent.* **27** no. 4 pp. 827–832, 4 refs. Geneva, N.Y., August 1934.

Previous work done on *Aphis maidis*, Fitch, in Kansas [*R.A.E.*, A **9** 248; **11** 7] is discussed, and the results of observations of its activities in that State on growing maize and *Sorghum* during the summers of 1931 and 1932 are recorded. As it remained on the three varieties of *Sorghum* throughout the summer, whenever immature plants were present in the fields, and was found on maize only for a brief period prior to the appearance of the tassels, it is concluded that it is primarily a pest of the former. Its migration from *Sorghum* to adjacent maize and back to *Sorghum* followed the production of large numbers of winged forms about 1st July and 1st August. In general, dent maize was preferred to sweet maize and *Sorghum* to either.

**SNAPP (O. I.) & THOMSON (J. R.). A Device for regulating the Quantity of Liquid used in Spraying.**—*J. econ. Ent.* **27** no. 4 pp. 832–834, 3 figs. Geneva, N.Y., August 1934.

An apparatus operating in the same way as the cylinder of a steam engine has been devised to spray out under pressure accurate quantities of liquids. It was used in the application of emulsions containing paradichlorobenzene, etc., to the soil round peach trees against *Aegeria exitiosa*, Say [*R.A.E.*, A **22** 640]. The liquid from the tank enters the cylinder under pressure at one end (A) and drives a plunger along the cylinder; the liquid on the other side of the plunger is thus forced out of the cylinder at the other end (B) through a pipe to the spray rod. When the stroke is completed, two valves are reversed by a lever so that the liquid is admitted into the cylinder at end B and expelled from it at end A. At one end of the cylinder is inserted a threaded shaft that regulates the length of the plunger stroke and consequently the quantity of liquid expelled by it.

**BORDEN (A. D.) & HENSILL (G. S.). A Method of studying comparative Oil Deposits of Proprietary Oil Emulsions.**—*J. econ. Ent.* **27** no. 4. pp. 834–841, 1 fig., 2 refs. Geneva, N.Y., August 1934.

Laboratory studies of both summer and dormant oil emulsions used on deciduous fruit trees in northern California have shown very definite variations in the amount of oil deposited, and field studies have shown a correlation between deposit and insecticidal value. The equipment used in this study, which is described in detail, was as nearly as possible an exact duplicate of standard orchard equipment. It enables bottles turning at 18–20 revolutions per minute to be exposed for a given length of time to the spray, which can be instantly shut off by lowering a metal plate. The distance from the nozzle-opening to the bottle is 38½ inches, and the nozzle is adjusted to give a narrow driving spray rather than a wide cone spray, which would tend to mist. All bottles were exposed to the spray at the same pressure for 15 seconds. Dormant emulsions were tested at 5 per cent. concentration and summer oil emulsions at 1 per cent. The bottles were coated with a thin film of

pure white beeswax at 100°C. and then cooled and weighed to 0.1 mg., sprayed, allowed to dry at 70°F., and re-weighed after 24 and again after 48 hours. The difference between the 48-hour weight and the weight before spraying gives the oil deposit per bottle. The average is taken for the bottles used in each test (24 for dormant and 12 for summer oils). Irregularities due to shrinkage of leaves, unequal evaporation, etc., are thus eliminated.

The deposits left per bottle (having an area of 24.4 sq. ins.) by 14 proprietary dormant oil emulsions tested, all commonly recommended for identical purposes at the same concentrations, ranged from 22 to 55.6 mg. From the 16 proprietary summer oil emulsions tested, the deposit varied from 4 to 28 mg. Deposits of 15 and 28 mg. were left by two emulsions of the same grade of light medium oil. Different deposits were correlated with the percentage of San José scale [*Aspidiotus perniciosus*, Comst.] killed in field tests by 5 per cent. dormant oil emulsions as follows: 53.6 mg., 97 per cent.; 47.9, 94; 37, 92; 25, 87.

Most of the uneven results obtained in field work with commercial oil emulsions are undoubtedly explained by the wide variations in oil deposit resulting from the many different types of emulsifying agents used in their manufacture.

SHEPARD (H. H.) & LINDGREN (D. L.). **The relative Efficiency of some Fumigants against the Rice Weevil and the Confused Flour Beetle.**—*J. econ. Ent.* **27** no. 4 pp. 842–845, 1 fig., 2 refs. Geneva, N.Y., August 1934.

On the basis of figures published by Neifert *et al.* in 1925 [*R.A.E.*, A **13** 178], the claim was made in 1932 that propylene dichloride was superior to carbon bisulphide for the control of insect pests of stored products. These figures, however, tend to exaggerate the problematic superiority of propylene dichloride by expressing the effective concentrations of the various compounds tested in terms of molecular percentages rather than those used in practical fumigation. The concentrations (in mg. per litre) required in the authors' experiments to kill 50 and (in brackets) 95–100 per cent. of *Calandra* (*Sitophilus*) *oryzae*, L., and *Tribolium confusum*, Duv., respectively, after 5 hours' exposure at 25°C. [77°F.] were as follows: carbon tetrachloride, 142 (350) and 200 (350); carbon bisulphide 23 (30) and 61 (73); ethylene dichloride alone, 35 (100) and 35 (60), and with 25 per cent. carbon tetrachloride, 60 (180) and 57 (100); propylene dichloride alone, 45 (100) and 43 (73), and with 25 per cent. carbon tetrachloride, 73 (100) of *T. confusum*. The results of 24 hours' exposure are also given. Propylene dichloride was always slightly less effective than ethylene dichloride except near the point of complete mortality of *C. oryzae*. On the other hand, when data for 5-hour exposures of *T. confusum* are plotted in terms of molecules, the two toxicity curves appear to coincide. These results show that it is impossible to generalise in detail regarding the relative toxicity of various fumigants.

BLANTON (F. S.) & SPRUIJT (F. J.). **Bordeaux-Oil Sprays as Repellents to the Lesser Bulb-fly.**—*J. econ. Ent.* **27** no. 4 pp. 845–848. Geneva, N.Y., August 1934.

The incorporation of 2 or 4 per cent. oil in sprays of Bordeaux mixture (4 : 4 : 50) applied to narcissus in the United States did not repel *Eumerus tuberculatus*, Rond. The 4 per cent. concentration

injured the foliage and possibly also the bulbs, thus leading to increased infestation. The Bordeaux mixture alone not only kept the plants in a healthy condition that reduced the chance of the larvae obtaining an entrance into the bulb, but also appeared to stimulate and invigorate growth.

CARTER (R. H.). **An Investigation of Solvents for the Removal of Lead Arsenate Residues from Fruits.**—*J. econ. Ent.* **27** no. 4 pp. 848–853. Geneva, N.Y., August 1934.

With a view to testing processes used in the United States for removing spray residues from fruit and vegetables, a study was made of the solubility of pure lead arsenate ( $\text{PbHAsO}_4$ ) in various acid solutions (with a normality of 0.136, which is equal to that of the 0.5 per cent. solution of hydrochloric acid commonly recommended for commercial use) and other materials.

The following is taken from the author's summary: The solubility is investigated first from the point of view of true solubility, in which the lead and arsenic go into solution in the same ratio as that in which they were present in the salt, and secondly from that of reactions in which one or both form other salts that are insoluble in the equilibrium mixture. Inorganic acids that furnish ions capable of forming soluble salts with both lead and arsenic exert a true solvent effect, hydrochloric acid being the best. Those (such as sulphuric and chromic) that furnish ions capable of forming insoluble lead salts dissolve more arsenic but less lead. Organic acids are apparently too weak to dissolve lead arsenate, but are capable of causing the precipitation of insoluble lead salts. This is true also when they are mixed with HCl. Solutions of salts, alone or mixed with acids, have no appreciable solvent action unless they also cause reactions forming other insoluble compounds. A high concentration of sodium chloride in HCl may be of some benefit in dissolving lead chloride. Some of the alkalis, especially sodium silicate and sodium hydroxide, dissolve appreciable quantities of both lead and arsenic, but weak ones have no recognisable action. The addition of salts to solutions of alkalis may be of some benefit. The use of wetting agents and degumming soaps helps to remove spray residues through the physical action of increased wettability, but probably they have not much actual solvent action.

HARRIS (H. M.) & DECKER (G. C.). **Paper Barriers for Chinch Bug Control.**—*J. econ. Ent.* **27** no. 4 pp. 854–857. Geneva, N.Y., August 1934.

In certain localities in Iowa, the type of soil renders impossible the construction of an ideal creosote barrier of the furrow and ridge type [cf. *R.A.E.*, A **14** 166, etc.] for preventing migration of *Blissus leucopterus*, Say. Experiments were therefore carried out in 1933 with a barrier consisting of a strip of creosote-soaked paper placed upright in a groove with the soil pulled against it and tamped to the same level on both sides. Post-holes to catch the bugs were dug at intervals 4–6 inches from the side of the paper with an edge sloping to it and dusted [with calcium cyanide]. Strips about  $4\frac{1}{2}$  inches in width gave the most satisfactory results, about 2 inches being left above the ground. The initial cost is more than offset by the reduced quantity of creosote required to maintain the barrier, a  $\frac{1}{4}$  mile of which can be laid by 2 men

in 3-4 hours. Red resin building paper stocked in 30-lb. rolls and costing 3s. a roll [at par] was the most frequently used, one roll making about  $\frac{1}{4}$  mile of 4 $\frac{1}{2}$ -inch barrier. The cost of tarred felt was 60 per cent. higher, but it does not have to be soaked in creosote. Corrugated cardboard of chip and straw composition is more rigid and elastic and more resistant to wind and rain. Although it requires more chemical for the initial treatment, it is in many ways the best of the materials tested, and might even be used for a second season.

Advantages of the paper barrier over those previously used include : its independence of the character of the soil ; the fact that bugs massed along it are not swept over by gusts of wind ; obviation of such difficulties as the glazing over of the oil or the settling of dust and rubbish on it to form bridges over which migrating bugs can pass ; reduction in the time and labour required to maintain the barrier and the amount of chemical required ; and finally the possibility of using more expensive and efficient chemicals. In preliminary tests, pine tar, pine oil, beta-naphthol, wood creosote and refined creosote have shown considerable promise.

JACOT (A. P.). **Acarina as possible Vectors of the Dutch Elm Disease.**—*J. econ. Ent.* **27** no. 4 pp. 858-859, 1 ref. Geneva, N.Y., August 1934.

Certain irregularities in connection with the transmission of *Ceratomyella* (*Graphium*) *ulmi* by *Scolytus multistriatus*, Marsh. [*cf. R.A.E.*, A **22** 392, etc.] suggest the existence of another unrelated factor in the spread of Dutch elm disease. Elms affected by the disease without showing any trace of Scolytids have been found in the United States. In addition to insects, it is possible that mites may carry the fungus. Most of the 10 species commonly found in elm bark can probably be ruled out. Tyroglyphids, however, which are found on elms in large numbers in all stages throughout the year, attach themselves in the "wandering nymph" stage to other Arthropods for transport to a new tree or locality. As many as 30 of these mites, which are known to be numerous on occasion on the coremia beds of *C. ulmi* in the egg tunnels of *Scolytus* and *Hylastes* (*Hylurgopinus*) [*rufipes*, Eichh.], have sometimes been found attached to a single adult of *S. multistriatus*. A minute unidentified mite has also been found attached to *Scolytus* larvae in their galleries. The relation of Gamasoid mites to their Lamiid host, *Eutetrappa* (*Saperda*) *tridentata*, Ol., common in elms, also remains to be investigated ; as many as 6-7 of these mites may occur on one beetle.

DONOHUE (H. C.) & BARNES (D. F.). ***Microbracon cushmani* Mues. attacking *Desmia funeralis* Hbn. in the San Joaquin Valley, California.**—*J. econ. Ent.* **27** no. 4 p. 859. Geneva, N.Y., August 1934.

*Desmia funeralis*, Hb. (grape leaf-folder) was found on 7th October 1932 causing severe damage in three vineyards in California, the losses being estimated at 10, 20 and 60 per cent. of the crop respectively for three different varieties of grapes. Besides rolling the leaves, the larvae fed on the clusters of ripe grapes, and by breaking the skin of the berries afforded entrance for various fungi. *Microbracon cushmani*, Mues., which has apparently not been previously recorded from this

host, was found actively parasitising the larvae in the rolled leaves. In 1933, infestation by *D. funeralis* was slight and injury materially less than in 1932. It is believed that the Braconid had been effective in controlling this outbreak.

COLMAN (W.). **Hydrogenated Naphthalene against Clothes Moths.**—*J. econ. Ent.* **27** no. 4 p. 860. Geneva, N.Y., August 1934.

Where continuous fumigation is not practicable, hydrogenated naphthalene (1, 2, 3, 4 tetrahydronaphthalene), which in preliminary tests has shown considerable promise against *Tineola biselliella*, Hum., has a distinct advantage over flake naphthalene owing to its greater volatility and more rapid action. It is a liquid that can be applied by spraying or by absorption in fabrics or other porous materials. It is cheap and non-injurious to fabrics and, under ordinary conditions, non-inflammable and non-explosive.

BARNES (D. F.) & FISHER (C. K.). **Stimulation of Fig Insects by certain Fumigants.**—*J. econ. Ent.* **27** no. 4 p. 860. Geneva, N.Y., August 1934.

The results are shown of 50 fumigations of figs carried out near Fresno, California, during the 1933 harvest with a view to finding a fumigant that would cause insect pests to leave the fruit before dying. The percentages were obtained by counting all the insects that died on the floor of the fumigation boxes and estimating by detailed examination of weighed samples the number killed inside the fruit. With a few unimportant exceptions, all the four fumigants tested were 100 per cent. lethal at the dosages used. The average percentages of larvae and adults of *Carpophilus hemipterus*, L. (in partly dried figs) and larvae of *Ephestia figulilella*, Gregson (in dried figs) killed outside the fruit by the different fumigants were: chloropicrin, 67·8, 72·3, 2·6; ethylene dichloride-carbon tetrachloride mixture, 60·6, 70, 0·5; carbon bisulphide, 10·1, 46·8, 0·2; calcium cyanide 1, 42·6, 0.

BOURNE (A. I.) & SHAW (F. R.). **Notes on Fungus attacking Onion Thrips.**—*J. econ. Ent.* **27** no. 4 pp. 860–861. Geneva, N.Y., August 1934.

Large numbers of onion thrips [*Thrips tabaci*, Lind.] found in Massachusetts in 1932 adhering to the leaves of onion plants were completely filled with mycelium of *Empusa* (?) *sphaerosperma*. The fungus was subsequently found to be well distributed throughout the onion-growing section of the Connecticut River Valley, and its appearance and increase in many fields coincided with a sharp decline in thrips abundance about mid-August. Although it was present over approximately the same area in 1933, it failed, owing to adverse weather conditions at midsummer, to cause an equal reduction in the numbers of thrips.

FLANDERS (S. E.). **The Secretion of the Colleterial Glands in the Parasitic Chalcids.**—*J. econ. Ent.* **27** no. 4 pp. 861–862. Geneva, N.Y., August 1934.

The colleterial glands of certain species of Chalcidoids contain a waxy substance, and the suction tubes by means of which many species

of Hymenopterous parasites feed on the body-fluids of their hosts in protected situations are apparently formed from the secretions of these glands. *Dibrachoides* [dynastes, Först.] feeds in this manner [R.A.E., A 19 66] on the cocooned prepupa of the alfalfa weevil [*Hypera variabilis*, Hbst.] and *Peridesmia* on the eggs of this weevil within the stems of lucerne. Although the feeding tube is delicate and brittle, it is strong enough to permit the entire contents of the egg to be sucked out. During oviposition, the eggs of these parasites apparently become coated with this secretion, which probably serves to fasten them to the host and may protect those of endoparasites from the phagocytic blood cells of the latter. Previous investigators have observed that phagocytes do not adhere to a greasy or waxy surface, but as soon as it is removed they are able to make contact and are then unable to free themselves again. Objects too large for ingestion by a single phagocyte accumulate many phagocytes and thus become encapsulated. The lethal effect of this encystment is probably due to the embryo being deprived of food and oxygen. It is possible that the presence of such a waxy coating on the egg would delay this encapsulation until hatching occurred. Variations in this protective coating and in the ability of the hosts to remove it may account in part for the specificity of certain endoparasites. A review of the literature indicates that cellular or phagocytic immunity does not occur among Aphids or the higher Hymenoptera, the number of blood-cells of which are reported to be relatively low. This appears to be correlated with the absence of cell coagulation.

GRISWOLD (G. H.). **Fish Meal as a Food for Clothes Moths.**—**Supplementary Note.**—*J. econ. Ent.* **27** no. 4 p. 862. Geneva, N.Y., August 1934.

The technique is described of preventing infestation by mites in containers used in breeding *Tineola biselliella*, Hum. [R.A.E., A 21 474], new colonies being started with eggs instead of adults.

The use of containers of  $\frac{1}{2}$  U.S. pint capacity in which the sprinkled layers of flannel are placed without the thick layer of fish meal used in the large containers has been found convenient for handling the larvae as they are more easily removed. A supply of larvae of any desired age can be maintained by this means. *Tinea pellionella*, L., can also be reared satisfactorily by this method.

CARTER (R. H.). **Solvents for Cryolite.**—*J. econ. Ent.* **27** no. 4 p. 863. Geneva, N.Y., August 1934.

In Washington State in 1933, difficulty was experienced in cleaning apples sprayed with cryolite and fish or mineral oil, even when these materials were used only in the last two cover sprays [cf. R.A.E., A 22 282]. As brush machine treatments removed the residues better than flotation or dipping, it was concluded that the action of the washing materials used was physical rather than chemical, and an attempt was made to find better solvents. The addition at 20°C. [68°F.] of 2 gm. sodium chloride per 100 cc. to dilute hydrochloric acid (1.5 gm. HCl per 100 cc.), a common practice in the removal of lead arsenate residues, reduced to about half the original amount of fluorine (0.2404 grain per 100 cc.) going into solution. The solubility of cryolite in water was also decreased by sodium chloride, sodium bicarbonate or monosodium phosphate. The addition of small amounts of such

materials in orchard spraying would therefore render it less soluble, prevent loss by running off of the solution and perhaps minimise danger of foliage injury by providing an optimum pH value.

The addition to 1.5 per cent. HCl or to water of ferric or aluminium salts increased the solubility of cryolite, and it was increased to 0.5576 grain fluorine per 100 cc. when the dilute HCl contained 1 gm. boric acid ( $H_3BO_3$ ) per 100 cc. There is no reason to believe that these solvents will be either deleterious to the fruit or less effective in removing lead arsenate than those now in use.

**DIMICK (R. E.) & MOTE (D. C.). Progress Report regarding the Introduction in Oregon of *Digonichaeta setipennis* Fall., a Tachinid Parasite of the European Earwig.—*J. econ. Ent.* 27 no. 4 pp. 863–865. Geneva, N.Y., August 1934.**

The numbers of adults of *Digonichaeta setipennis*, Fall., reared for liberation against the European earwig [*Forficula auricularia*, L.] in Oregon and Washington [*cf. R.A.E.*, A 20 23] were 27,151 in 1931, more than 50,000 in 1932, and about 25,000 in 1933. Ether was found more satisfactory than chloroform for anaesthetising the earwigs prior to artificial parasitisation. Reductions in their numbers in 1932 and 1933 were attributed to the Tachinid. In a number of localities in which liberations had not been made, the earwig appeared to be increasing. About 1,200 puparia were exported in March 1932 to New Zealand, and from these 1,071 adults were obtained.

**KNULL (J. M.). Scouting for Elm Scolytids.—*J. econ. Ent.* 27 no. 4 pp. 865–866, 1 map. Geneva N.Y., August 1934.**

A survey begun on 16th September 1933 to ascertain the distribution of Scolytids attacking elm in the eastern United States failed to reveal the presence of *Scolytus scolytus*, F., in any of the areas inspected, a list of which is given. In most of the localities visited, there are veneer factories where imported elm logs have been utilised.

The abundance of *S. multistriatus*, Marsh. [*cf. R.A.E.*, A 22 392] round Boston, New York and Philadelphia suggests that it may have been introduced at all three of these ports. The infestation radiating from New York extends into Connecticut and north along the Hudson River Valley, the mountainous section west of this river probably acting as a partial barrier. The infestation of New Jersey (which covers all except the southern part of the State) may have originated both from New York and from Philadelphia, whence it extends north into Pennsylvania and west to the Susquehanna River. The mountains running diagonally across Pennsylvania again probably act as a barrier, owing to the absence of elm in the highlands.

The survey also showed a wide range of distribution, including several States, for *Hylastes (Hylurgopinus) rufipes*, Eichh., another possible vector of Dutch elm disease [*Ceratostomella ulmi*]. Some previous records of *S. multistriatus* may refer to it.

**GAINES (R. C.) & ISLER (D. A.). Machinery for dusting Cotton.—*Fmrs' Bull. U.S. Dep. Agric.* no. 1729, 14 pp., 10 figs. Washington, D.C., July 1934.**

In this bulletin, which supersedes a previous one [*R.A.E.*, A 11 458], brief descriptions are given of various types of machines (showing their

adaptability to different requirements) for use in the United States in applying calcium arsenate dust to cotton against the boll-weevil [*Anthonomus grandis*, Boh.]. The chief advantage that aeroplanes have over ground machinery is that they render possible the treatment of fields immediately after heavy or prolonged rains, when the weevils may be causing serious damage. Experience has proved that their use is not more costly.

**HINDS (W. E.). Sugar Cane Borer Hibernation and the Effects of various Methods of Trash Disposal upon the Survival of the Borers therein.**—*Sugar Bull.* **12** no. 7 pp. 3–5. New Orleans, La, 1st January 1934. [Recd. September 1934.]

Comparisons of the numbers of borers [*Diatraea saccharalis*, F.] collected during 1927–33 from the tops of sugar-cane in heavily infested localities in Louisiana where the trash is disposed of during the winter by burying or burning [*cf.* R.A.E., A **22** 578] indicate that burning reduces infestation by about 75 per cent. As natural mortality probably increases as the winter advances, the most significant figures are usually obtained in late February or March, after which date pupation of the overwintered larvae has begun and all stages found may be expected to give rise to adults. Important factors of natural control include extreme cold and unusually heavy rain, which causes an excess of standing water and sometimes complete flooding. Though the greater part of the carry-over occurs in the top trash left in the cane fields after harvest, some larvae may survive in old, standing maize stalks, in grasses growing along fence rows, ditches, etc., or in rice stubble. The selection of practically borer-free seed cane [*cf.* **21** 656] eliminates almost entirely this source of infestation, and little hibernation can occur in stubble where the cane is cut at the surface of the ground.

**BURKE (H. E.). Some important Insect Enemies of Shade Trees in central and southern California.**—*Proc. 9th nat. Shade Tree Conf.* pp. 49–59. New York, 1933. [Recd. September 1934.]

Of the insect pests of *Quercus agrifolia*, the most important is *Phryganidia californica*, Pack., which has two generations a year, the larvae of the second feeding on the old leaves during the winter and completing their growth on the new. It may be controlled by a single spraying in spring. Other defoliators against which lead arsenate sprays are effective are *Hemerocampa vetusta*, Boisd., *Malacosoma californica*, Pack., and *M. constricta*, Stretch. For the relatively unimportant defoliation caused by *Andricus bicornis*, McCracken & Egbert, which produces a two-horned gall along the veins on the lower surface of the leaves, there is no satisfactory control. The larvae of *Agrilus angelicus*, Horn, gnaw spiral mines under the bark of twigs and kill them, but the adults feed on the leaves and can be controlled by spraying with lead arsenate. *Prionoxystus robiniae*, Peck, is destroyed by injecting carbon bisulphide into the mines and then closing them with putty, and *Aegeria mellinipennis*, Boisd., by surrounding the infested trunk with a tent, in the top of which carbon bisulphide is placed on cotton waste.

*Euphyllura arbuti*, Schwarz, attacks *Arbutus menziesii* and may be controlled by an oil and nicotine spray applied before the buds open.

Nicotine and soap sprays applied in spring, and repeated sprayings with strong oil emulsions control *Corythucha incurvata*, Uhl., and *Epidiaspis* (*Diaspis*) *leperii*, Sign. (*piricola*, del G.) respectively, on *Heteromeles* (*Photinia*) *arbutifolia*. *Stomacoccus platani*, Ferris, and *Lithocolletis* (*Phyllonorycter*) *felinella*, Heint., have spread from the Californian sycamore [*Platanus racemosa*] to the introduced oriental plane [*P. orientalis*]. The Coccid may be found in crevices of the bark throughout the year, but in spring the young scales begin to feed on the sap of the new leaves. The leaves of a heavily infested tree are thickly spotted with brown and fall early. Very little work has been done on control, but an oil spray applied to the bark has been recommended. Raking and burning of the leaves gives good control of *Lithocolletis*, because pupation takes place in the mines within the leaves after they have fallen.

Among the pests of Monterey cypress [*Cupressus macrocarpa*] [R.A.E., A **21** 46] is a sawfly, *Susana cupressi*, Rohwer & Middleton, the larvae of which soon completely defoliate a tree. A spray of oil and nicotine is effective against *Ehrhornia cupressi*, Ehrh., and *Neochmosis* (*Dilachnus*) *tujafilinus*, del G., and, with the addition of a wax solvent, against *Pseudococcus sequoiae*, Colem.

Of the pests of the Monterey pine (*Pinus radiata*) [cf. **21** 46, 193], *Halisdota consobrina*, Stretch, and a sawfly of the genus *Acantholyda* (*Itycorsia*) can be controlled by lead arsenate sprays, *Eriophyes pini*, Nal., *Thecodiplosis piniradiatae*, Snow & Mills, and *Toumeyella pinicola*, Ferris, by oil-nicotine, and *Vespamima sequoiae*, Hy. Edw., by scraping off the masses of resin and crushing the caterpillars beneath them. The only effective measure against *Pityophthorus carmeli*, Swaine, and *Ips confusus*, Lec., is burning the infested dead and dying trees.

HAMILTON (C. C.). **The Control of Insects boring in Ornamental Shrubs and Shade Trees.**—*Proc. 9th nat. Shade Tree Conf.* pp. 59–73, 18 refs. New York, 1933. [Recd. September 1934.]

This paper is an attempt to bring together the most important work that has been done on insects boring in ornamental shrubs and shade trees. The damage done by a considerable number of insects in the United States is described, and they are grouped according to whether they infest the root or crown, twigs or small limbs, cambium bark, or cambium bark and wood. Control measures are recommended, and some suggestions for further work are made.

MIDDLETON (W.). **The Scope of the Shade-tree and Hardy-shrub Insect Problem with special Reference to the Conditions found in 1932.**—*Proc. 9th nat. Shade Tree Conf.* pp. 73–85. New York, 1933. [Recd. September 1934.]

The author gives reasons for believing that the great increase in the number of requests for advice from the U.S. Bureau of Entomology on pests of shade trees and hardy shrubs is due to an increase in the actual number of insect infestations. Separate tables arranged under insects and food-plants show the relative frequency of requests in respect of various pests, and other tables, compiled from the correspondence of the Bureau, give the local distribution of the requests and compare the number of requests in 1932 with those of the preceding years.

**Department of Entomology and Zoology.**—*Rep. Ont. agric. Coll.* **59** (1933) pp. 102–107. Toronto, 1934.

The removal from orchards and their vicinity of hawthorn trees [*Crataegus*], seedling apples or apples that were impossible to treat and the application of two special sprays greatly reduced the numbers of the apple maggot [*Rhagoletis pomonella*, Walsh] in all parts of Ontario in 1933. The amount of infested fruit was less than 10 per cent. of that in the previous year. Most of the orchards were free from infestation, and many others only contained a few trees on which infested fruit could be found.

The European corn borer [*Pyrausta nubilalis*, Hb.] may be destroyed by disking the maize fields (on which the crop has been cut as low as possible) both lengthwise and crosswise and ploughing the stubble, which has thus been loosened and pulled apart, with a wide-bottom plough equipped with a skimmer (jointer) drawn lengthwise. The soil is then worked with a disk, and the next crop is sown with a disk drill, thus keeping all the stubble below the ground. As a result of the Corn Borer Act [*R.A.E.*, A **17** 394], hardly a field has been destroyed and only about a dozen have been severely injured during the last three years in the two counties in which about 75 per cent. of the crop was destroyed in 1926. Large-scale experiments proved that thorough ploughing will effect a 95 per cent. mortality.

Insect pests have caused losses to individual farmers of over 1,000 bushels of stored wheat, both by feeding on it and by causing heating and the development of moulds. New grain should be sold soon after threshing rather than stored in previously infested granaries. At temperatures below 40°F., eggs present in grain that has been run through a fanning mill [*cf.* **22** 304] will be killed, as the grain quickly cools down. If the winter temperature often falls below zero, the other stages will be destroyed before the spring provided that the grain is not piled deeply. Emptied bins should be swept and the sides and floor sprayed heavily with kerosene if infestation is noticed.

Tests carried out during the last 5 years showed that all ants may be controlled in houses by a bait of thallium sulphate, sugar and water and that most kinds may be killed by one of tartar emetic and honey (1 : 20). Sprays or dusts of nicotine sulphate, and pyrethrum and derris extracts proved of little value against the tarnished plant bug [*Lygus pratensis*, L.] on celery; sulphur dust or wettable sulphur spray gave good control.

**GAHAN (A. B.). Descriptions of some new Species of Chalcidoidea from Cuba and Puerto Rico.**—*Mem. Soc. cubana Hist. nat.* **8** no. 3 pp. 125–134. Havana, August 1934.

Among the six new species described is the Eupelmid, *Arachnophaga albolinea*, bred from pupae of the Tachinid, *Argyrophylax albincisa*, Wied., parasitising *Lamprosema indicata*, F., on lima beans in Cuba.

**RUSSELL (T. A.). The Mediterranean Fruit-fly.**—*Agric. Bull. Bermuda* **13** no. 8 pp. 59–60. Hamilton, August 1934.

Among adults of *Ceratitis capitata*, Wied., reared from infested peaches in June in Bermuda, four examples were found of the Braconid larval parasite, *Opius humilis*, Silv., which was introduced from Hawaii

in 1926 [*R.A.E.*, A 15 177] but did not appear to have established itself. The parasite was not found among flies from loquat, pepper [*Capsicum*] or Surinam cherry [*Eugenia uniflora*].

HAMILTON (A.). **Codling Moth in Canterbury. An Investigation into the Life-history and Habits of the Codling Moth during the Season 1932-33.**—*N.Z.J. Sci. Tech.* 16 pp. 1-8, 101, 5 figs., 5 refs. Wellington, N.Z., July and September 1934.

In experiments at Christchurch, New Zealand, larvae of *Cydia pomonella*, L., collected in the autumn of 1932 were kept over winter in racks containing cells covered with glass. Pupation continued from 19th September to 10th January, and the pupal stage varied from 22 to 53 days, being shorter later in the season. The moths emerged from the first week in November to 1st February. In the succeeding generation, pupation occurred between 25th January and 10th February, the pupal period varied from 19 to 22 days, and the moths emerged between 16th February and 12th March. The fact that the moth has two generations a year in the Canterbury Plain had not previously been recognised. The occurrence of the second generation was demonstrated in the orchard as well as in the laboratory, but it is too small to be of economic importance. Experiments showed that the young larva enters the apple where it is shaded from light, and that if the calyx is closed it enters at the side.

DUMBLETON (L. J.). **The Apple Leaf-hopper (*Typhlocyba australis* Frogg.).**—*N.Z. J. Sci. Tech.* 16 no. 1 pp. 30-38, 4 figs., 16 refs. Wellington, N.Z., July 1934.

*Typhlocyba froggatti*, Baker (*australis*, Frogg. nec Walsh), with which *T. xanthippe*, McA., has been found to be identical, first came into prominence as an apple pest in New Zealand in 1918. The recorded food-plants of this Jassid include hawthorn (*Crataegus*) and plum in France, apple in the United States, apple and prune in New South Wales, and apple and hawthorn in New Zealand. In New Zealand, there are two generations in the year [*cf. R.A.E.*, A 18 32]; the average length of adult life was 33 days for females and 28 and 23 days, respectively, for mated and unmated males. Nicotine sulphate (1 : 800) applied about the first week of November when the first nymphs from the overwintered eggs are beginning to reach the adult stage, followed by a second spray about three or four weeks later, is recommended. If necessary, two sprays may be similarly applied against the summer-brood nymphs, the first about the end of January.

The eggs were parasitised by *Anagrus armatus* var. *nigriventris*, Gir., which also attacks them in the United States. All stages of this Mymarid are described. It overwinters as a larva in the host eggs. In 1932, adults emerged from 29th November to 21st December, the peak of emergence being in the second week of December. Pupae were found in the summer eggs on 17th January, and an adult parasite was observed in the insectary on 25th January. Adults continued to emerge from apple leaves until 8th April. The first parasitised overwintering eggs were noted on 13th February. The observation on March 23rd 1934 of pupae of *Anagrus* in overwintering eggs on hawthorn indicated that there is at least a partial third brood of the parasite. During 1933, parasitism varied between 78 and 93 per cent. The

author considers that it would probably be worth while to introduce into New Zealand a Dryinid parasite of some species of *Typhlocyba* in the hope that it would parasitise the nymphs and adults of *T. froggatti*. He also suggests that a method of disposing of the prunings should be devised that will allow *Anagrus* to mature and emerge from the eggs in the twigs.

COTTIER (W.). **The European Red-mite in New Zealand** (*Paratetranychus pilosus* Can. and Fanz.).—*N.Z.J. Sci. Tech.* **16** no. 1 pp. 39–56, 8 figs., 5 refs. Wellington, N.Z., July 1934.

Experiments in the life-history of *Paratetranychus pilosus*, C. & F., carried out at Palmerston North and Tiritea, New Zealand, are described. All stages of this mite, which is an important apple pest in New Zealand [*R.A.E.*, A **21** 66], are described in detail. The period from hatching to adult averaged 12·5 days for females and 11·7 for males, the larval, protonymphal, deuteronymphal and pre-oviposition periods of the former averaging 4·4, 3·4, 4·6 and 3·5 days respectively. The average number of eggs laid by unfertilised females was 16, with a maximum of 30, and by fertilised females 18, with a maximum of 23, over average periods of 12·2 and 16 days respectively. The incubation period averaged 11·7 days for summer eggs and about three months for winter ones. In an experiment at Palmerston North eggs laid between 4th and 31st March 1932 hatched in an average of 14 days, but of eggs laid at Tiritea between 4th March and 6th April 1932 not one hatched before winter. Sterile summer eggs shrivel two or three weeks after the end of the normal period of incubation, but these eggs remained healthy long after that. The author considers that the difference is best explained by the supposition that the unhatched ones were winter eggs laid by a winter-egg-laying generation that had been produced through scarcity of food. The only significant difference in the conditions of the two experiments was that in the former the eggs were laid by mites that originated from green foliage, whereas those that laid the winter eggs originated from withered foliage. As eggs laid at the end of January on one block of trees hatched at the same time as eggs laid in April on another block a short distance away, females that lay winter eggs evidently do not recur at intervals of a definite number of generations. Winter eggs laid very early on withered leaves did not survive to the next spring so readily as those laid later on trees with green foliage. Again, it has been observed in midsummer that on unsprayed trees with withered foliage there are no mites, whereas mites are present on sprayed trees with green leaves. It is concluded that if the foliage turns brown very early in the season, the mite disappears, but that if it turns brown about the end of January, winter eggs may be laid.

Of the natural enemies, only a species of *Scymnus* near *S. minutulus*, Broun, is of importance, and it appears too late to check the mite effectively.

WARD (K. M.). **Tar Distillate Sprays. Uses on Fruit Trees.**—*J. Dep Agric. Vict.* **32** pt. 8 pp. 381–385, 3 figs., 7 refs. Melbourne, August 1934.

A general account of tar distillate sprays is given, and recommendations are made for their use against *Myzus persicae*, Sulz., on peach in Victoria [*cf. R.A.E.*, A **21** 480; **22** 483].

PESCOTT (R. T. M.). **The Vegetable Weevil** (*Listroderes costirostris* Gyll.).—*J. Dep. Agric. Vict.* **32** pt. 8 pp. 410–413, 6 figs. Melbourne, August 1934.

An account is given of the bionomics of *Listroderes costirostris*, Schönh. (*obliquus*, Gyll.). In Victoria, carrots and turnips are the preferred food-plants of the larvae, and potato and tomato of the adults. The eggs are laid from about the middle of March to the middle of September, from 1 to 30 a day and from 300 to 1,500 a season being laid by one individual. Reproduction is parthenogenetic [cf. *R.A.E.*, A **21** 168]. The larvae usually hatch in 11–24 days, and by mid-winter 5–12 are often seen feeding on one plant. The pupal stage lasts 14–16 days. Among control measures suggested are harrowing during July–October to break up the pupal cells, rotation of crops, and keeping fields clear of wild food-plants, particularly Cape weed (*Cryptostemma calendulaceum*) and marsh mallow (*Malva rotundifolia*). Dusting or spraying with lead arsenate is recommended, and a moistened bait of 10 lb. bran, the juice of 12 lemons and 1 lb. calcium arsenate or 4 oz. Paris green is also effective.

GURNEY (W. B.). **Records of some new Insect Pests.**—*Agric. Gaz. N.S.W.* **45** pt. 8 pp. 452–454, 5 figs. Sydney, 1st August 1934.

The Lamellicorn known as the black-beetle [cf. *R.A.E.*, A **22** 343] has now been identified as the Dynastid, *Heteronychus arator*, F. It was apparently introduced into New South Wales from South Africa, where it is a pest of maize and sugar-cane. At one time it was erroneously thought to be *Metanastes vulgivagus*, Olliff (*blackburni*, Arrow), of which *Pentodon australis*, Blkb., is a synonym. *Forficula auricularia*, L., which has been locally numerous in New South Wales for about four years and caused considerable damage to garden plants during 1934, is recorded for the first time from the mainland of Australia. *Asynonychus* (*Pantomorus*) *godmani*, Crotch, also recorded for the first time, was found attacking *Aspidistra* in a garden. The adults of a native Melolonthid, *Phyllotocidium macleayi*, Blkb., caused appreciable damage to apple blossoms in September and October 1924 and October 1927, when *Citrus* was also attacked but to a less extent. The outbreaks were confined to one district.

**Insect Pests and their Control.**—*Agric. Gaz. N.S.W.* **45** pt. 8 pp. 455–459, 6 figs. Sydney, 1st August 1934.

These notes, which belong to a series on insect pests in New South Wales [cf. *R.A.E.*, A **22** 547], deal with termites, silverfish, the use of chemically treated bands against *Cydia pomonella*, L., on apple, and the application of nicotine sulphate sprays in spring for the control of *Anuraphis persicae-niger*, Smith, and *Myzus persicae*, Sulz., on peach.

OCFEMIA (G. O.) & BUHAY (G. G.). **Bunchy-top of Abacá, or Manila Hemp : II. Further Studies on the Transmission of the Disease and a Trial Planting of Abacá Seedlings in a Bunchy-top devastated Field.**—*Philipp. Agric.* **22** no. 8 pp. 567–581, 2 figs., 14 refs. Laguna, P.I., January 1934.

OCFEMIA (G. O.). **Bunchy-top of Abacá : Its Nature and Control.**—*Op. cit.* **23** no. 3 pp. 174–186, 6 figs., 4 refs. Laguna, P.I., August 1934.

*Pentalonia nigronervosa*, Coq., is common on bananas and Manila hemp (*Musa textilis*) in the Philippines, but bunchy-top, of which it is

the vector, has never been observed on bananas there, even when growing close to infected Manila hemp. Moreover, in a series of experiments here described, the Aphid failed to transmit the disease to bananas. It is therefore suggested that the virus concerned may be distinct from that causing the severe bunchy-top of banana in Australia. In experiments with Manila hemp, it was found that the Aphid must feed on infected plants for at least 12 hours before it can transmit the disease to healthy seedlings. An incubation period of 24–48 hours was necessary within the body of the vector, and the incubation period within the plant varied from 30–32 days in fast-growing seedlings to 60–72 days in slow-growing ones. The virus was not transmitted from the viviparous female vector to its offspring, nor was it mechanically transmitted by pin-pricks. It was found possible to grow uninfected Manila hemp in a field previously devastated by the virus, by planting about 2 months after all the old corms and roots of Manila hemp and banana had been removed. The holes in which the plants were set were sprayed with nicotine sulphate (1 : 1,500), and the plants themselves were then sprayed to ensure freedom from Aphids.

The second paper comprises a general account of the symptoms and transmission of the disease and of measures for its control [cf. *R.A.E.*, A 20 45].

BROOKS (P.). **The Bookworm vanquished.**—*Philipp. Agric.* 23 no. 3 pp. 171–173. Laguna, P.I., August 1934.

The difficulties of controlling *Sitodrepa panicea*, L., when infesting books are discussed. Very serious damage was caused in the Huntington Library, San Marino, California, but vacuum fumigation of the books with carboxide (a mixture of ethylene oxide and carbon dioxide) proved effective.

MADRID (V. J.). **Biological Studies on the Cucurbit-leaf Beetle, *Ceratia similis* (Olivier) (Chrysomelidae, Coleoptera), with special Reference to Control with Arsenical Insecticides.**—*Philipp. Agric.* 23 no. 3 pp. 197–225, 2 figs., 12 refs. Laguna, P.I., August 1934.

The immature stages are described of *Ceratia similis*, Ol., a serious pest of cucurbits in the Philippines. The adults feed, in the early morning and late afternoon, on the flowers and leaves of cucurbits and occasionally on pollen grains of rice, maize, sugar-cane and other plants. The eggs are laid at any time during the day in cool weather, but mostly in the afternoon or evening. In the field, they were found near cucurbit stems below the surface of the soil, but in the laboratory in the absence of soil they were laid singly or in masses of 2–5 on the petioles of the leaves. The larvae hatched after 8–15 days and bored for 18–35 days in the stems of the food-plants. The pupal period ranged from 4 to 14 days. Pairing took place 16–68 days after emergence, and the pre-oviposition period was 1–46 days. The females laid from 86 to 1,359 eggs during 51–137 days and lived 115–225 days, the males living 103–238. Young cucurbits appeared to be more attractive. Plants severely attacked in the early stages were killed or stunted.

For control of the adults on cucurbits, the formulae recommended are a spray of 3 lb. lead arsenate and 1 lb. quick-lime, or of 1½ lb. calcium arsenate (which, however, sometimes scorched the leaves) and 2½ lb. quick-lime, in 100 gals. water, and a dust of calcium arsenate and air-slaked lime (1 : 10). In the laboratory, they gave 68, 72 and 84 per

cent. mortality, respectively. In the field, 3 applications at intervals of 5–7 days, the first being made when the young leaves were completely formed, protected the plants during the critical period; 2 further applications improved the results. The mortality of untreated plants was 38–46 per cent. and of treated ones 0–14. The cost and results of the dust and sprays were approximately equal, but the sprays are probably more economical for commercial use.

**TSAI (Pang-hwa). A Forecast of the Outbreak of Locust in China.** [In Chinese.]—*Ent. & Phytopath.* **2** no. 23 pp. 456–461, 1 fig. Hangchow, China, 11th August 1934. (With a Summary in English.)

Outbreaks of locusts in China appear to occur chiefly after dry, warm winters. Their occurrence is connected with the periodicity of the weather, which is itself related to sun-spots [*R.A.E.*, A **22** 563]. For this reason, outbreaks of *Schistocerca gregaria*, Forsk., in Egypt, Palestine, Persia and northern India and of *Locusta migratoria*, L., in central and north China occurred in 1927 and following years. Drought and high temperatures during May–July stimulate the development and reproduction of *Locusta* in China, and an outbreak was therefore anticipated in the autumn of 1934.

**KOIDSUMI (K.). Experimentelle Studien über die Transpiration und den Wärmehaushalt bei Insekten.** [Experimental Studies on Transpiration and Heat Regulation in Insects.]—*Mem. Fac. Sci. Agric. Taihoku Univ.* **12** no. 1 (Ent. no. 3) pp. 1–179, 45 figs., many refs. Taihoku, Formosa, April 1934. [Recd. September 1934.]

This work is divided into seven sections, *viz.*: general notes and quantitative determination of animal transpiration; the amount of transpiration at various parts of the insect body; the physiological components of transpiration in insects; the influence of air humidity on insect transpiration; the influence of air temperature on insect transpiration; the influence of air movement and light on insect transpiration; and the duration of transpiration in various insects at various air humidities.

**BARANOFF (N.). Neue Gattungen und Arten der orientalischen Raupenfliegen (Larvaevoridae).** [New Genera and Species of Oriental Tachinids.]—*Encycl. ent.* B II Dipt. **7** pp. 160–165. Paris, 1934.

Among the new species described is *Hapalioloemus* (gen. n.) *machaeralis*, reared from *Hapalia machaeralis*, Wlk., in India. *Cossidophaga*, gen. n., is erected for *Podomyia atkinsoni*, Aubertin, which was described from *Xyleutes (Duomitus) ceramicus*, Wlk., in Burma [*R.A.E.*, A **20** 192] and is here recorded from the same host in the Netherlands Indies.

**SÉGUY (E.). Contribution à l'étude des mouches phytophages de l'Europe occidentale. II.**—*Encycl. ent.* B II Dipt. **7** pp. 167–264, 12 refs. Paris, 1934.

This continued study of the phytophagous Diptera of western Europe [*cf. R.A.E.*, A **20** 578] includes a number of Calyptrate and Acalyptrate Muscids, several of which are of economic importance. An

index to the plants, showing the flies recorded from them in both papers, is appended.

GONZÁLEZ-REGUERAL Y BAILLY (F.). **Las Cochinillas de los agríos y su tratamiento.** [The Coccids of Citrus Plants and their Control.] —43 pp., 28 figs., 14 refs. Valencia, Estac. Fitop. agric. Levante, Burjasot, 1932. [Recd. September 1934.]

The first part of this paper deals briefly with the bionomics of the Coccids infesting *Citrus* in Spain, which include *Lepidosaphes pinnaeformis*, Bch., *L. gloveri*, Pack., *Chrysomphalus dictyospermi*, Morg., *Parlatoria zizyphus*, Lucas, *Coccus hesperidum*, L., *Saissetia oleae*, Bern., *Ceroplastes sinensis*, del G., *Pseudococcus citri*, Risso, and *Icerya purchasi*, Mask. The second part includes descriptions of spraying equipment and formulae for oil emulsion and lime-sulphur sprays, with practical notes on their application.

THIEM (H.) & GERNECK (R.). **Untersuchungen an deutschen Austerschildläusen (Aspidiotini) im Vergleich mit der San José-Schildlaus (*Aspidiotus perniciosus* Comst.).** [Investigations on German Oyster-shell Scales in Comparison with the San José Scale.]—*Arb. morph. taxon. Ent. Berl.* **1** nos. 2-3, pp. 130-158, 208-238, 5 figs., 6 pls., 3 pp. refs. Berlin, 25th June and 12th September 1934.

In view of the establishment of *Aspidiotus perniciosus*, Comst., in Hungary, Austria, Portugal and Rumania, it is important that it should be clearly distinguished from German species of *Aspidiotus*. An account is therefore given of the results of a detailed morphological study of *A. perniciosus* and of the German species, viz., *A. ostreaeformis*, Curt., *A. pyri*, Licht., *A. gigas*, sp. n. (described from willow), *A. labiatarum*, March., *A. zonatus*, Frauenf., *A. bavaricus*, Ldgr., *A. abietis*, Schr., *A. hederæ*, Vall., *A. britannicus*, Newst., and *A. alni*, March. *Epidiaspis leperii*, Sign. (*betulae*, auct.) is also included, owing to its being often confused with species of *Aspidiotus*.

REICHERT (A.). **Rosenschädlinge.** [Rose Pests.]—*Kranke Pflanze* **11** no. 9 pp. 104-106, 1 pl. Dresden, September 1934.

Popular notes are given on the bionomics of two Aphids, *Macrosiphum* (*Siphonophora*) *rosæ*, L., and *Capitophorus* (*S.*) *rosarum*, Kalt., which infest roses in Germany, the former being the commoner.

KLEIN-KRAUTHEIM (F.). **Die Zwiebelmondfliege (*Eumerus strigatus* Fall.) als Schädling von Runkelrüben.** [The Onion Fly, *E. strigatus*, as a Pest of Beet.]—*Anz. Schädlingssk.* **10** no. 9 pp. 99-101, 4 figs., 3 refs. Berlin, September 1934.

The Syrphid, *Eumerus strigatus*, Fall., infests onions, other species of *Allium* and Liliaceae generally in Germany, where it has also been recorded from potato tubers [*R.A.E.*, **A** **22** 175]. In 1931, the author bred it, together with other Diptera and the Braconid, *Apanteles lineola*, Curt., from beetroots that had been left in the ground through the winter and were lifted in spring and left lying in the field. The roots contained a hollow space with galleries leading upwards and downwards. Most of the empty pupal cases of *E. strigatus* were near the

outer surface, so that adult emergence was easy. The other Diptera were probably secondary pests. In view of its size, *A. lineola* is believed to be a parasite of *E. strigatus* and not of the other flies.

TELENGA (N. A.). **Parasiten und ihre Bedeutung in der Dynamik des Traubenwicklers** (*Polychrosis botrana* Schiff.). [Parasites and their Importance in the Fluctuation of Abundance of the Vine Moth.].—*Anz. Schädlingssk.* **10** no. 9 pp. 101–106, 3 figs., 6 refs. Berlin, September 1934.

The investigations described were carried out in 1930 and 1931 in the Crimea, in districts where *Polychrosis botrana*, Schiff., was the vine moth present. Larvae of the first generation were twice as abundant as those of the second, the third generation being still smaller. Parasites were one of the most important limiting factors. Those bred were: *Trichogramma evanescens*, Westw.; *Perilampus tristis*, Ruschka; the Chalcid, *Hockeria bispinosa*, F.; the Ichneumonids, *Omorgus difformis*, Gmel., *Pristomerus vulnerator*, Panz., *Cremastus ornatus*, Szepel., *Anilastus ebeninus*, Grav., *Trichomma enecator*, Rossi, *Phytodietus segmentator*, Grav., *Pimpla alternans*, Grav., *Exochus notatus*, Hlmgr., and *Thyraella collaris*, Grav.; the Braconids, *Microdus tumidulus*, Nees, and *Ascogaster quadridentata*, Wesm.; and the Tachinids, *Nemorilla (Thyella) floralis*, Fall., and *Arrhinomyia (Elodia) tragica*, Mg. Notes are given on the seasonal occurrence of the parasites in relation to that of their host. The approximate oviposition periods of the three generations of the moth were 8th May–20th June, 2nd July–8th August, and 17th August–20th September, and the larval periods 22nd May–12th July, 7th July–30th August, and 1st–30th September. The percentage of the larvae parasitised in 1930 and 1931 were 19.2 and 20.1 by *M. tumidulus*, 9.7 and 2.2 by *O. difformis* and other Ichneumonids, and 4 and 1.7 by Tachinids. *O. difformis* alone destroyed 4.4 per cent. in 1930 but was negligible in 1931. This species and *Microdus* were active when the host larvae were abundant, but the Tachinids only appeared when most of them had pupated, and were therefore unimportant. *T. evanescens* was not obtained from eggs of the second or third generation, but destroyed up to 39 per cent. of those of the first in 1930, and up to 12 per cent. in 1931. Its decrease in summer was probably due to unfavourably high temperatures in July, during oviposition by the second generation. Those registered as average day-temperatures were 21.4–24.5°C. [70.52–76.1°F.], with a maximum of 28.9°C. [84.02°F.], and in the vineyards the temperature was higher. In all, about 60 per cent. of the first generation of *P. botrana* was parasitised, and about 3–4 per cent. of the larvae of the second. No parasites were obtained from the third.

[VOLCHANETZKIĖ (I.).] VOLČANEZKIJ (I.). **Notizen über die ökonomische Bedeutung einiger Vögel in der Jeruslansteppe, USSR, der Wolgadeutschen.** [Notes on the Economic Importance of some Birds in the Yeruslan Steppe, Republic of the Volga Germans.].—*Anz. Schädlingssk.* **10** no. 9 pp. 107–110. Berlin, September 1934.

Records are given of the results of the examination of the stomach-contents, including insects, of a number of birds, but no conclusion is reached as to their economic importance.

[KOZHANCHIKOV (I. V.).] **Кожанчиков (И. В.). Die Rolle des Energieumsatzes während der Puppenmetamorphose von *Agrotis segetum* Schiff. und *Ephestia kühniella*, Zell.** [The Rôle of the Expenditure of Energy during the Pupal Development of *Euxoa segetum* and *Ephestia kühniella*. (In Russian and German.)]—*C. R. Acad. Sci. URSS* **2** no. 9 pp. 595–600. Leningrad, 21st June 1934.

A. Krogh (1914) in experiments with pupae of *Tenebrio molitor*, L., found that the total amount of energy expended in the process of development was constant at all temperatures. In the author's investigations in Russia, in which pupae of *Euxoa* (*Agrotis*) *segetum*, Schiff., and *Ephestia kühniella*, Zell., were kept at 80 and 60 per cent. relative humidity respectively, the highest percentage of pupae survived at about 20°C. [68°F.] and about 22–24°C. [71.6–75.2°F.] respectively. At these temperatures, the total expenditure of energy during the pupal period (as gauged by the amount of oxygen consumed) was lower than at most of the higher or lower temperatures. In the case of *Euxoa*, however, the total amount of energy began to drop again above 22°C., so that the actual minimum was reached at 32.3°C. [90.1°F.], coinciding with the shortest period of development. With a reduction in temperature, the amount of energy spent in a given time was reduced, but below the thermic optimum this was outweighed by the prolongation of pupal development. Females from pupae that had developed at a temperature below the optimum laid a greater number of eggs, so that egg production appears to be negatively correlated with the amount of energy expended in a given time.

McKAY (R.). **Injury to Apple Trees due to Paraffin Oil used for the Control of Woolly Aphis.**—*J. Pomol.* **12** no. 2 pp. 167–176, 2 pls., 5 refs. London, July 1934.

A canker that was not associated with a fungus and caused the death of apple trees in a nursery in southern Ireland was traced to the use of paraffin oil (kerosene) applied with a brush for the control of woolly aphid [*Eriosoma lanigerum*, Hsm.]. It was shown experimentally that the oil, even when applied in small quantities, injures or kills the shoots of a number of varieties and causes the bark to crack or to scale up in flakes, particularly on wood of the current or the previous year, though branches up to 5 years old were killed by a single treatment. A description is given of various types of injury, which was more severe on infested trees, as the punctures of the Aphids appeared to facilitate the entrance of the oil. The application of paraffin or petrol alone to apple trees in the dormant season or in summer was found to be inadvisable, but methylated spirits proved to be harmless.

#### PAPERS NOTICED BY TITLE ONLY.

PARR (T. J.). **Practical Control Work on European Pine Shoot Moth [*Rhyacionia buoliana*, Schiff.] and White Pine Weevil [*Pissodes strobi*, Peck.] in C.C.C. Camps in Connecticut.**—*Proc. 9th nat. Shade Tree Conf.* pp. 92–94. New York, 1933. [Recd. September 1934.] [*Cf. R.A.E., A* **22** 396.]

HINDS (W. E.), OSTERBERGER (B. A.) & DUGAS (A. L.). **Sugar Cane Borer [*Diatraea saccharalis*, F.] Control by *Trichogramma* [*minimum*, Riley] in Louisiana, 1933.**—*J. econ. Ent.* **27** no. 4 pp. 788–795. Geneva, N.Y., August 1934. [*Cf. R.A.E., A* **22** 578.]

- TISSOT (A. N.). **Two new Aphids of the Tribe Macrosiphini** [in Florida].—*Florida Ent.* **18** no. 2 pp. 17–23, 21 figs. Gainesville, Fla, June 1934.
- CHAPMAN (R. N.) & WHANG (W. Y.). **An Experimental Analysis of the Cause of Population Fluctuations** [in *Tribolium confusum*, Duv.].—*Science* **80** no. 2074 pp. 297–298, 1 fig., 10 refs. New York, 28th September 1934.
- SPEICHER (K. G.). **Impaternate Females in *Habrobracon*** [*Microbracon hebetor*, Say (*juglandis*, Ashm.)].—*Biol. Bull.* **67** no. 2 pp. 277–293, 11 refs. Woods Hole, Mass., October 1934.
- OTERO (J. I.) & COOK (M. T.). **Partial Bibliography of Virus Diseases of Plants** [with brief annotations].—*J. Agric. Univ. P.R.* **18** no. 1–2 pp. 1–410. Rio Piedras, P.R., August 1934.
- EDWARDS (W. H.). **A Lecture on Pests of Bananas in Jamaica.**—*J. Jamaica agric. Soc.* **38** nos. 4 & 7 pp. 195–205, 389–405, 9 figs., 12 refs. Kingston, Jamaica, April & July 1934. [See *R.A.E.*, A **22** 450.]
- KÖHLER (P.). **Catalogo preliminar de los Lepidopteros argentinos dañinos** [with list of food-plants].—*Bol. Minist. Agric. Argent.* **36** no. 1 pp. 25–46. Buenos Aires, 1934.
- MARUMO (N.). **Studies on Rice Borers. II. Classification of the Subfamily Siginae in Japan.** [In Japanese].—*Minist. Agric. For. Japan Dep. Agric., Nojikairyoshiryō* no. 90 [4] 2, 29 [1] 5 [1] pp., 5 pls. Tokyo, August 1934. [Cf. *R.A.E.*, A **21** 568.]
- WONG (Chi-yu) & TAO (Chia-chu). **A Record of injurious Insects collected from the Trap Lantern of the Bureau of Entomology, Hangchow.** [In Chinese, but including scientific names of insects].—*Ent. & Phytopath.* **2** no. 23 pp. 451–455. Hangchow, 11th August 1934.
- GREEN (E. E.). **On the Type of *Antonina purpurea* Sign., with a Description of a new Species (*A. sulcii*) from Mid-Europe (Insecta, Coccidae).**—*Proc. zool. Soc. Lond.* **1934** pt. 3 pp. 509–511, 2 pls. London, September 1934.
- MEYER (E.). **Beobachtungen über die Larve von *Phyllotreta vittula* Redtb.** [Observations on the Larval Morphology of *P. vittula*.]—*Arb. morph. taxon. Ent. Berl.* **1** nos. 2–3, pp. 158–166, 179–186, 11 figs, 10 refs. Berlin, 25th June & 12th September 1934.
- BEHLEN (W.). **Die Erbsenlaus (*Macrosiphon onobrychis* B. d. F.), ein äusserst gefährlicher Luzerneschädling.** [The Pea Aphis (*Macrosiphum onobrychis*, Boy.), an extremely dangerous Pest of Lucerne in Germany.].—*Nachr. Schädl. Bekämpf.* **9** no. 2 pp. 89–95, 3 figs., 8 refs. Leverkusen, August 1934. (With Summaries in English, French & Spanish.) [Cf. *R.A.E.*, A **22** 385.]
- GARAVINI (G.) & PAOLI (G.). **La lotta contro le cavallette in Provincia di Roma nel 1932.** [Work against Locusts (*Dociostaurus maroccanus*, Thnb.) in the Province of Rome in 1932.].—*Nuovi Ann. Agric.* **12** reprint 22 pp., 21 figs. Rome, 1932. [Recd. September 1934.] [Cf. *R.A.E.*, A **22** 192.]

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 AGRICULTURAL JOURNAL, DEPARTMENT OF AGRICULTURE, BRITISH COLUMBIA (VICTORIA): Vol. I (1916). Nos. 1 and 2.  
 AGRICULTURAL NEWS (BARBADOS): Nos. 1, 25, 26, 34, 66 (1902-04).  
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 BIOLOGICAL BULLETIN OF THE MARINE BIOLOGICAL LABORATORY (WOODS HOLE, Mass):  
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 BOLETIN DE LA DIRECCION DE ESTUDIOS BIOLOGICAS (MEXICO):  
 TOMOS I-II (1924-25).  
 BULLETIN DU COMITÉ D'ÉTUDES HISTORIQUES ET SCIENTIFIQUES DE L'AFRIQUE OCCIDENTALE FRANÇAISE (PARIS): Année 1919, No. 1.  
 BULLETIN AGRICOLE DE L'ALGÉRIE—TUNISIE—MAROC (ALGIERS).  
 Année XX (1914). Nos. 7-9, 12-14 and Title-page.  
 CALIFORNIA AGRICULTURAL EXPERIMENT STATION (BERKELEY, CAL.):  
 Circulars 14 and 42 (1905-09).  
 CANADA: DEPARTMENT OF AGRICULTURE: EXPERIMENTAL FARMS:  
 Fletcher (J.). Reports of the Entomologist and Botanist for the Years 1886 and 1888 (Ottawa, 1887-89).  
 CHACARAS E QUINTAES (SÃO PAULO): Indices to Vols. X, XI, XII and XIV.  
 COMPTES RENDUS DES SÉANCES DE L'ACADÉMIE D'AGRICULTURE DE FRANCE (PARIS): Tome VIII (1922) No. 5.  
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 Vol. IV (1888) Title-page. Vol. V (1889), Nos. 6 & 8.  
 ENTOMOLOGISCHE LITTERATURBLÄTTER (BERLIN): 6 Jahrg. (1906). Nos. 2 & 10.  
 EXPERIMENT STATION RECORD (WASHINGTON, D.C.): Vols. I-IV (1889-94).  
 GEORGIA STATE BOARD OF ENTOMOLOGY (ATLANTA):  
 Bulletin: 2, 6, 22 and 28. Circular: 1 to 3, 12, 15 to 18 and 20.  
 GRASSI (B.) et al. Contributo alla conoscenza delle Filloserine ed in particolare della Fillossera della Vite (Rome, 1912).  
 INDIA: FOREST RESEARCH INSTITUTE (DEHRA DUN).  
 Forest Bulletin (Old Series): Nos. 1-3.  
 Forest Leaflet (Zoology Series): Nos. 1-2.  
 INDIAN MEDICAL GAZETTE (CALCUTTA):  
 Vol. L (1915) No. 10; LI (1916) Nos. 1-7, 10; LII (1917) No. 7 and title-page & index; LIII (1918); and LIV (1919) No. 2.  
 INDIANA: Third Annual Report of the State Entomologist, 1909-10.  
 JOURNAL OF THE BOARD OF AGRICULTURE OF BRITISH GUIANA (DEMERARA):  
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 JOURNAL OF THE SOUTH-EASTERN AGRICULTURAL COLLEGE (WYE, KENT):  
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 KENTUCKY AGRICULTURAL EXPERIMENT STATION (LEXINGTON, Ky.):  
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- NEW JERSEY STATE DEPARTMENT OF AGRICULTURE (TRENTON, N.J.) : Bulletin 2 ;  
Circular : 2, 12, 29 (1917-19).
- NEW YORK STATE MUSEUM (ALBANY, N.Y.) : Bulletin : 26<sup>1</sup> & 57 (1899-1902).
- ONTARIO ENTOMOLOGICAL SOCIETY REPORT (TORONTO) : 9th (1878).
- ORMEROD (E. A.). OBSERVATIONS OF INJURIOUS INSECTS AND COMMON FARM  
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